Nokia Customer Care

Service Manual

RM-10;RM-24 (Nokia E70)

Mobile Terminal

Part No: 9246101 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

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Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	05/2006	TSa	

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Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

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ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

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Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

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Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

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- Title of the Document + Issue Number/Date of publication
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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

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Nokia E70 Service Manual Structure

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1 — General Information

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RM-10/24 product selection

Nokia RM-10/24 is a triple band EGSM 900/1800/1900 phone, supporting WCDMA (3GPP Release 4).

According to GSM standard 05.05 it responds to class 4 (max. 2W) in EGSM 900, class 1 (1W) in GSM 1800 and class 1 in GSM 1900. RM-10/24 supports EGPRS (EDGE) class B as well as Bluetooth 1.2 standard. The handset has a full phase 2 Type Approval and it complies with the GSM Type Approval. RM-10/24 also has a full CE approval and FCC approval.

It has an integrated 2.0 Mega pixel (UXGA 1600x1200) Camera

The MMS implementation follows the OMA MMS standard release 1.2.

WAP 2.0 compatible browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

RM-10/24 uses Symbian 8.0a operating system and supports also MIDP Java 2.0 & CLDC1.1, providing a good platform for 3rd party applications.

Figure 1 View of RM-10/24

RM-10/24 product features and sales package

Imaging

- Active TFT colour display, 352 x 416 pixels, 16M colours
- 64 MB on-board user memory
- MiniSD memory card slot
- USB (Pictbridge), BT wireless technology

Bearers & transport

- WCDMA2000 Max DL=384kbps UL=128kbps, simultaneous voice & packet data

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- GSM Triband World Phone E900/1800/1900 EGPRS (class B, Multislot class 10) (Max DL=236.8 kbps UL=118.4 kbps)

Software platform

- SW platform: Nokia Series 60 3.0

Connectivity

- Integrated WLAN (IEEE 802.11g,WPA2)
- USB 2.0 full-speed
- Bluetooth 1.2
- Pop-Port™ connector with ACI
- IrDA (115 kbps)

Productivity

- SMS, MMS and email
- MS Word, PowerPoint , Excel and Adobe PDF viewers
- PIM (Calendar & Contacts)
- Internet browser
- Video streaming (3GPP)
- Push to Talk
- Logs (last calls , timers and history list)
- Instant messaging
- Java™ MIDP 2.0, CLDC 1.13D API, PIM API, File access API
- MP3
- Data Transfer
- Settings Wizard/Access Point Configurator

Sales package

- Transceiver RM-10/24
- BL-6C Li-ion Battery Cell
- ACP-12 Charger
- All-in-one User Guide (warranty card + accessory info + getting started sheet + invitational module for Club Nokia)
- QSG
- CD-ROM
- Stereo Headset HDS-3
- USB Cable CA-53
- MiniSD 64 MB with adapter (not in RM-24 sales package)
- Add-on application guide

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Product and module list

Module name	Type code	Notes
System/RF Module	1EM	Main PWB with components
Flip module	1FF	Flip PWB with components. Part of the flip assy.
Display Module		
Chassis Assy		Mechanical Assembly
UI Frame Assy		Mechanical Assembly
SW Module		

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T)	Weight (g)	Volume (cm^3)
Transceiver with BL-6C Li-Ion battery	117X53X22mm	128	102 (closed)

Main RF characteristics for triple-band (EGSM900/GSM1800/GSM1900) and WCDMA phones

Parameter	Unit
Cellular system	EGSM900, GSM1800/1900 and WCDMA
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA: 2110 - 2170 MHz
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA: 1920 - 1980 MHz
Output power	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 24 dBm
Number of RF channels	GSM900: 125
	GSM1800: 375
	GSM1900: 300
	WCDMA: 277

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Parameter	Unit
Channel spacing	200 kHz
Number of Tx power levels	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-6C	1150	• up to 3.6-7.3 hrs (GSM) • up to 2.5-3.9 hrs (WCDMA) • up to 4.3-6 hours* (VoIP)	• 7.2 - 9.3 days (GSM) • 7.0 - 9.2 days (WCDMA) • 5.1 - 6.2 days* (GSM/ WCDMA and WLAN)

Operation times may vary depending on radio access technology, network and usage.

*In GSM/WCDMA network: WLAN network supporting 11-54 Mbs; 1-10 users

Charging times

ACP-12	LCH-12
~2h	~2h

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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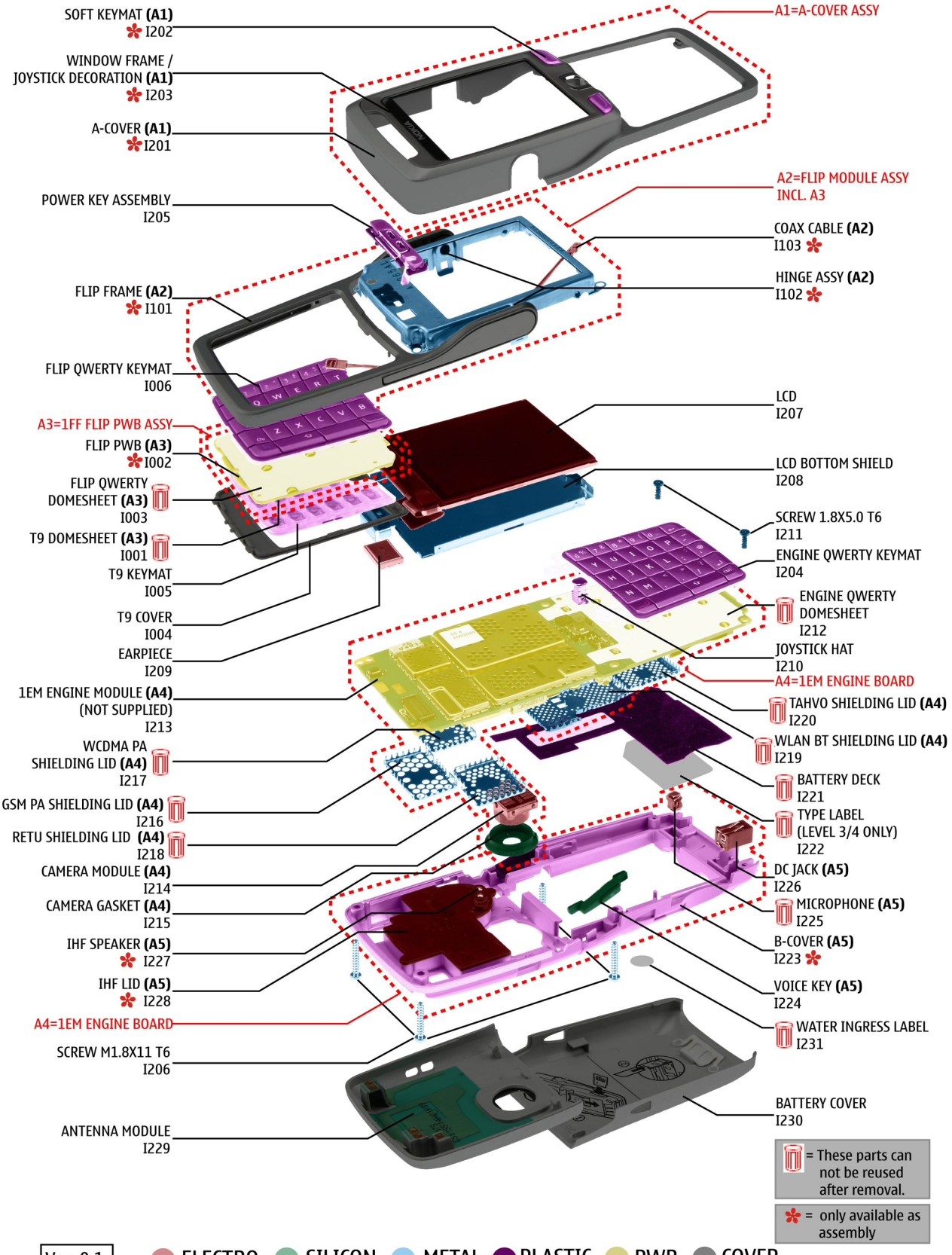
Exploded view

Exploded view



Ver. 0.1 ELECTRO SILICON METAL PLASTIC PWB COVER

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Parts lists

RM-10 mechanical spare parts list

- Bold = assembly (assy)
- I0xx = ITEM codes for upper or mono block
- I1xx = ITEM codes for hinge block
- I2xx = ITEM codes for lower block
- I3xx = ITEM codes for soldered spare parts in the upper hinge or lower block and not exchangeable

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS).
To ensure you are always using the latest codes, please check the PWS on a daily basis.

ITEM/CIRCUIT REF.	QTY	PART NAME
A1	1	A-COVER ASSY(I201-I203)
I201	1	A-COVER
I202	1	SOFT KEYMAT
I203	1	WINDOW FRAME / JOYSTICK DECORATION
I204	1	ENGINE QWERTY KEYMAT
I205	1	POWER KEY ASSEMBLY
I206	4	SCREW M1.8X11 T6
A2	1	FLIP MODULE ASSY(I101-I103;I001-I003;I301)
I101	1	FLIP FRAME
I102	1	HINGE ASSY
A3	1	1FF Flip PWB ASSY (I001-I003;I301 AND PARTS OF THE SOLDERING COMPONENTS SECTION)
I001	1	T9 DOMESHEET
I002	1	FLIP PWB
I003	1	FLIP QWERTY DOMESHEET
I103	1	COAX CABLE
I004	1	T9 COVER
I005	1	T9 KEYMAT
I006	1	FLIP QWERTY KEYMAT
I207	1	LCD
I208	1	LCD BOTTOM SHIELD
I209	1	EARPIECE
I210	1	JOYSTICK HAT
I211	2	SCREW 1.8X5.0 T6
I212	1	ENGINE QWERTY DOMESHEET

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ITEM/CIRCUIT REF.	QTY	PART NAME
A4	1	1EM ENGINE BOARD(I214 - I221 AND PARTS OF THE SOLDERING COMPONENTS SECTION)
I213	1	1EM ENGINE MODULE
I214	1	CAMERA MODULE
I215	1	CAMERA GASKET
I216	1	GSM PA SHIELDING LID
I217	1	WCDMA PA SHIELDING LID
I218	1	RETU SHIELDING LID
I219	1	WLAN BT SHIELDING LID
I220	1	TAHVO SHIELDING LID
I221	1	BATTERY DECK
I222	1	TYPE LABEL
A5	1	B-COVER ASSY(I222-I227)
I223		B-COVER
I224	1	VOICE KEY
I225	1	MICROPHONE
I226	1	DC JACK
I227	1	IHF SPEAKER
I228	1	IHF LID
I229	1	ANTENNA MODULE
I230	1	BATTERY COVER
I231	1	WATER INGRESS LABEL

RM-24 mechanical spare parts list

- Bold = assembly (assy)
- I0xx = ITEM codes for upper or mono block
- I1xx = ITEM codes for hinge block
- I2xx = ITEM codes for lower block
- I3xx = ITEM codes for soldered spare parts in the upper hinge or lower block and not exchangeable

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

ITEM/CIRCUIT REF.	QTY	PART NAME
A1	1	A-COVER ASSY(I201-I203)
I201	1	A-COVER
I202	1	SOFT KEYMAT

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ITEM/CIRCUIT REF.	QTY	PART NAME
I203	1	WINDOW FRAME / JOYSTICK DECORATION
I204	1	ENGINE QWERTY KEYMAT
I205	1	POWER KEY ASSEMBLY
I206	4	SCREW M1.8X11 T6
A2	1	FLIP MODULE ASSY(I101-I103;I001-I003;I301)
I101	1	FLIP FRAME
I102	1	HINGE ASSY
A3	1	1FF Flip PWB ASSY (I001-I003;I301 AND PARTS OF THE SOLDERING COMPONENTS SECTION)
I001	1	T9 DOMESHEET
I002	1	FLIP PWB
I003	1	FLIP QWERTY DOMESHEET
I103	1	COAX CABLE
I004	1	T9 COVER
I005	1	T9 KEYMAT
I006	1	FLIP QWERTY KEYMAT
I207	1	LCD
I208	1	LCD BOTTOM SHIELD
I209	1	EARPIECE
I210	1	JOYSTICK HAT
I211	2	SCREW 1.8X5.0 T6
I212	1	ENGINE QWERTY DOMESHEET
A4	1	1EM ENGINE BOARD(I214 - I221 AND PARTS OF THE SOLDERING COMPONENTS SECTION)
I213	1	1EM ENGINE MODULE
I214	1	CAMERA MODULE
I215	1	CAMERA GASKET
I216	1	GSM PA SHIELDING LID
I217	1	WCDMA PA SHIELDING LID
I218	1	RETU SHIELDING LID
I219	1	WLAN BT SHIELDING LID
I220	1	TAHVO SHIELDING LID
I221	1	BATTERY DECK

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ITEM/CIRCUIT REF.	QTY	PART NAME
I222	1	TYPE LABEL
A5	1	B-COVER ASSY(I222-I227)
I223		B-COVER
I224	1	VOICE KEY
I225	1	MICROPHONE
I226	1	DC JACK
I227	1	IHF SPEAKER
I228	1	IHF LID
I229	1	ANTENNA MODULE
I230	1	BATTERY COVER
I231	1	WATER INGRESS LABEL

RM-10/24 component parts list

Component parts list (1 em-25a)

Item	Side	Grid		Description and value		
A2100	Bottom	U	7	1EM_RIGID	PWB RIGID 1EM_LIFTING	~
A2200	Bottom	E	3	SHIELD_040_011760	RETU CAN 040-011760	~
A2300	Bottom	S	7	SHIELD_040_011763	TAHVO CAN 040-011763	~
A4100	Top	I	3	SHIELD_040_014599	COMBO SHIELD 040-014599	~
A4200	Top	I	7	SHIELD_040_003608	BB CAN 040-003608	~
A6000	Bottom	N	7	SHIELD_040_011766	WLAN-BT CAN 040-011766	~
A7001	Bottom	E	8	SHIELD_DMC07007	WDCMA PA CAN DMC07007 RM-1	~
A7002	Bottom	B	5	SHIELD_DMC07005	GSM PA CAN DMC07005 RM-1	~
A7003	Bottom	E	6	SHIELD_DMD11427	VCO CAN DMD11427 RM-1	~
A7004	Top	D	7	SHIELD_040_014600	VINKU SHIELD 040-014600	~
A7005	Top	D	3	SHIELD_040_005293	RF ENGINE CAN 040-005293	~

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Item	Side	Grid		Description and value		
B2200	Bottom	E	2	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz
C1470	Bottom	G	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1471	Bottom	J	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2000	Bottom	U	5	0402C	Chipcap 5% NP0	27p
C2002	Bottom	V	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2003	Bottom	U	5	0402C	CERCAP X7R 22N K 16V 0402	22n
C2004	Bottom	U	5	0402C	CERCAP X7R 22N K 16V 0402	22n
C2005	Bottom	U	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2006	Bottom	U	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2011	Bottom	T	7	0402C	CHIPCAP NP0 270P J 25V 0402	270p
C2012	Bottom	V	4	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n
C2071	Bottom	D	2	0402C	Chipcap 5% NP0	27p
C2072	Bottom	H	6	0402C	Chipcap 5% NP0	10p
C2073	Bottom	H	6	0402C	Chipcap 5% NP0	10p
C2100	Bottom	T	6	0402C	CHIPCAP X7R 15N K 16V 0402	15n
C2101	Bottom	T	6	0402C	CHIPCAP X7R 15N K 16V 0402	15n
C2102	Bottom	S	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2103	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C2104	Top	F	4	0402C	Chipcap X7R 10% 50V 0402	1n0
C2105	Bottom	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2106	Bottom	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2107	Bottom	G	6	0402C	Chipcap X7R 10% 50V 0402	1n0

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Item	Side	Grid		Description and value		
C2108	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2109	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2110	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2200	Bottom	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2201	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2202	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2203	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2204	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2205	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2206	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2207	Bottom	D	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2208	Bottom	E	1	0402C	Chipcap 5% NP0	27p
C2209	Bottom	E	1	0402C	Chipcap 5% NP0	22p
C2210	Bottom	D	4	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C2211	Bottom	E	4	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2212	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2213	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2214	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2215	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2216	Bottom	F	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2217	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0

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Item	Side	Grid		Description and value		
C2219	Bottom	E	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2220	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2221	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2222	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2223	Bottom	G	3	0402C	Chipcap X7R 10% 16V 0402	10n
C2224	Bottom	G	3	0402C	Chipcap X7R 10% 16V 0402	10n
C2225	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2226	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2227	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2228	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2230	Bottom	D	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2231	Bottom	F	4	0805C	CHIPCAP X5R 10U M 6V3 0805	10U
C2232	Bottom	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2233	Bottom	J	1	0402C	Chipcap 5% NP0	27p
C2237	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2238	Bottom	F	3	0402C	Chipcap 5% NP0	27p
C2239	Bottom	F	3	0402C	Chipcap 5% NP0	27p
C2300	Bottom	S	8	0402C	Chipcap X7R 10% 16V 0402	10n
C2301	Bottom	T	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2302	Bottom	S	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2303	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2304	Bottom	S	6	0402C	Chipcap X7R 10% 16V 0402	10n

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Item	Side	Grid		Description and value		
C2306	Bottom	T	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2307	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2309	Bottom	T	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2312	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2313	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2314	Bottom	Q	8	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2315	Bottom	Q	7	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2316	Bottom	S	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2317	Bottom	S	8	0402C	Chipcap 5% NP0	27p
C2701	Bottom	O	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2800	Top	H	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2801	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2802	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2803	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2804	Top	G	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2805	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2806	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2807	Bottom	G	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2808	Bottom	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2809	Top	H	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2810	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n

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Item	Side	Grid		Description and value		
C2811	Top	I	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2812	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2813	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2814	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2815	Top	I	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2830	Top	H	9	0402C	Chipcap 5% NP0	10p
C3000	Bottom	I	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3001	Bottom	J	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3002	Bottom	J	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3003	Top	I	8	0402C	Chipcap X7R 10% 16V 0402	10n
C3004	Top	F	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3005	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3006	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3007	Top	G	6	0402C	Chipcap X7R 10% 16V 0402	10n
C3008	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3100	Bottom	M	5	0402C	Chipcap 5% NP0	27p
C4200	Top	H	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4201	Top	H	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4202	Top	I	3	0402C	Chipcap X7R 10% 16V 0402	10n
C4206	Top	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4207	Top	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0

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Item	Side	Grid		Description and value		
C4208	Bottom	J	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C4209	Bottom	I	6	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C4210	Bottom	I	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C4405	Top	F	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4406	Top	L	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4407	Top	F	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4409	Bottom	J	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C4410	Bottom	J	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4412	Top	L	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C4413	Top	B	7	0402C	Chipcap 5% NP0	27p
C4414	Top	H	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4415	Top	G	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4416	Top	G	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4417	Top	H	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4418	Bottom	G	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4419	Top	G	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C4420	Top	H	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C4421	Top	H	6	0402C	Chipcap 5% NP0	27p
C4422	Top	I	2	0402C	Chipcap 5% NP0	27p
C4800	Top	J	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4801	Top	K	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4802	Top	I	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n

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Item	Side	Grid		Description and value		
C4803	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4804	Top	I	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4805	Top	J	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4806	Top	J	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4807	Top	L	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4808	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4809	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4810	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4811	Bottom	G	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4812	Top	I	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4813	Top	L	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C5000	Bottom	J	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5001	Bottom	J	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5002	Bottom	J	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5003	Top	K	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5004	Bottom	J	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5005	Top	I	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5006	Bottom	J	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C5200	Bottom	R	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C5201	Top	L	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n

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Item	Side	Grid		Description and value		
C5202	Top	M	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6030	Bottom	K	6	0402C	Chipcap 5% NP0	100p
C6031	Bottom	L	7	0402C	Chipcap 5% NP0	15p
C6033	Bottom	K	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6036	Bottom	L	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6037	Bottom	L	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6038	Bottom	L	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6039	Bottom	K	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6040	Bottom	K	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6041	Bottom	K	6	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6042	Bottom	L	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6043	Bottom	L	7	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6044	Bottom	K	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6045	Bottom	K	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6051	Bottom	K	6	0402C	Chipcap 5% NP0	10p
C6300	Bottom	P	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C6301	Bottom	P	6	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C6302	Bottom	P	8	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C6303	Bottom	P	7	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C6304	Bottom	P	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6305	Bottom	P	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6307	Bottom	O	8	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0

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Item	Side	Grid		Description and value		
C6308	Bottom	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6309	Bottom	M	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6310	Bottom	M	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6311	Bottom	M	6	0402C	chipcap x7r 47n k 10v 0402	47n
C6312	Bottom	M	8	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C6313	Bottom	M	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6314	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6315	Bottom	N	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6317	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6318	Bottom	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6319	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6320	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6321	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6322	Bottom	P	7	0402C	Chipcap X7R 10% 50V 0402	1n0
C6323	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6324	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6325	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6326	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6327	Bottom	O	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6330	Bottom	K	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7

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Item	Side	Grid		Description and value		
C6335	Bottom	L	8	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6338	Bottom	K	8	0402C	Chipcap 5% NP0	47p
C6340	Bottom	L	8	0402C	Chipcap +-0.25pF NP0	6p8
C6344	Bottom	M	7	0402C	Chipcap +-0.25pF NP0	6p8
C6345	Bottom	M	7	0402C	Chipcap +-0.25pF NP0	6p8
C6346	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6347	Bottom	O	6	0402C	Chipcap 5% NP0	82p
C6348	Bottom	N	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6351	Bottom	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6352	Bottom	N	6	0402C	Chipcap 5% NP0	150p
C6360	Bottom	M	8	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6361	Bottom	M	6	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6364	Bottom	L	7	0402C	Chipcap +-0.25pF NP0	6p8
C6365	Bottom	L	7	0402C	Chipcap +-0.25pF NP0	6p8
C6366	Bottom	K	7	0402C	Chipcap +-0.25pF NP0	6p8
C6367	Bottom	K	7	0402C	Chipcap +-0.25pF NP0	6p8
C6410	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C7400	Bottom	G	8	0402C	Chipcap 5% NP0	18p
C7401	Bottom	C	9	0402C	Chipcap +-0.25pF NP0	5p6
C7403	Bottom	F	5	0402C	Chipcap 5% NP0	18p
C7404	Bottom	F	5	0402C	Chipcap +-0.25pF NP0	2p7
C7405	Bottom	D	4	0402C	Chipcap 5% NP0	18p
C7407	Top	E	4	0402C	Chipcap X7R 5% 16V 0402	10n
C7501	Top	E	4	0402C	Chipcap 5% NP0	18p
C7503	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7504	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7505	Top	C	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C7507	Top	C	4	0402C	Chipcap 5% NP0	18p

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Item	Side	Grid		Description and value		
C7508	Top	C	5	0402C	Chipcap 5% NP0	18p
C7509	Top	C	4	0402C	Chipcap +-0.25pF NP0	2p7
C7512	Bottom	C	3	0402C	Chipcap +-0.25pF NP0	2p7
C7513	Top	D	3	0402C	Chipcap X7R 10% 25V 0402	4n7
C7514	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	2p7
C7515	Top	E	3	0402C	Chipcap 5% NP0	10p
C7516	Top	E	2	0402C	Chipcap 5% NP0	150p
C7518	Bottom	E	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C7520	Top	E	4	0402C	Chipcap 5% NP0	18p
C7522	Top	D	3	0402C	Chipcap 5% NP0	150p
C7523	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	3p9
C7524	Top	C	2	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2
C7525	Bottom	C	5	0402C	Chipcap +-0.25pF NP0	3p9
C7526	Top	E	5	0402C	Chipcap +-0.25pF NP0	5p6
C7527	Top	C	3	0402C	Chipcap 5% NP0	100p
C7528	Top	H	9	0402C	Chipcap 5% NP0	22p
C7529	Top	D	5	0402C	Chipcap 5% X7R	1n0
C7530	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7531	Top	H	9	0402C	Chipcap 5% NP0	22p
C7532	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7533	Top	D	5	0402C	Chipcap X7R 5% 16V 0402	10n
C7534	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7536	Top	E	4	0402C	Chipcap X7R 10% 16V 0402	8n2
C7540	Top	E	6	0402C	Chipcap 5% NP0	18p
C7541	Top	E	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7542	Top	E	7	0402C	Chipcap 5% NP0	18p
C7543	Top	E	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7545	Bottom	A	6	0402C	Chipcap +-0.25pF NP0	4p7

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Item	Side	Grid		Description and value		
C7547	Top	D	6	0402C	Chipcap +-0.25pF NP0	1p8
C7548	Top	E	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7549	Top	E	7	0402C	Chipcap 5% NP0	100p
C7550	Top	C	6	0402C	Chipcap +-0.25pF NP0	2p7
C7552	Top	C	6	0402C	Chipcap +-0.25pF NP0	2p7
C7553	Top	C	6	0402C	Chipcap X7R 10% 16V 0402	8n2
C7554	Bottom	F	6	0402C	Chipcap +-0.25pF NP0	4p7
C7555	Bottom	F	6	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5
C7556	Bottom	C	6	0402C	Chipcap 5% NP0	10p
C7558	Top	D	8	0402C	Chipcap 5% X7R	1n0
C7559	Bottom	C	5	0402C	Chipcap +-0.25pF NP0	1p0
C7560	Top	C	6	0402C	Chipcap X7R 10% 25V 0402	4n7
C7561	Bottom	C	6	0402C	Chipcap +-0.25pF NP0	4p7
C7563	Bottom	C	6	0402C	Chipcap +-0.25pF NP0	4p7
C7564	Bottom	B	5	0402C	Chipcap 5% X7R	1n0
C7567	Top	D	7	0402C	Chipcap 5% NP0	15p
C7568	Top	C	6	0402C	Chipcap 5% NP0	150p
C7569	Bottom	B	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7570	Top	D	6	0402C	Chipcap 5% NP0	18p
C7571	Bottom	F	6	0402C	CHIPCAP NP0 330P J 50V 0402	330p
C7573	Top	C	6	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2
C7575	Top	C	7	0402C	Chipcap 5% NP0	15p
C7577	Top	D	7	0402C	Chipcap 5% NP0	15p
C7579	Bottom	D	8	0402C	Chipcap 5% NP0	10p
C7580	Bottom	D	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7581	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	4p7
C7582	Top	C	6	0402C	Chipcap 5% NP0	100p
C7583	Bottom	F	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7

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Item	Side	Grid		Description and value		
C7584	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	4p7
C7585	Bottom	E	8	0402C	CHIPCAP NP0 1P0 B 50V 0402	1p0
C7586	Bottom	E	9	0402C	Chipcap 5% NP0	10p
C7587	Bottom	E	9	0402C	Chipcap 5% NP0	10p
C7589	Bottom	F	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7590	Bottom	E	8	0402C	Chipcap 5% NP0	10p
C7591	Bottom	E	7	0402C	CHIPCAP NP0 470P J 6V3 0402	470p
C7592	Bottom	E	7	0402C	Chipcap 5% X7R	3n3
C7593	Bottom	C	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7596	Top	D	4	0402C	Chipcap +-0.25pF NP0	2p7
C7597	Bottom	I	9	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V
C7598	Top	D	3	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5
D2800	Top	G	7	uBGA_289	RAP3G V2.20E-PA UMC8D F761800F 12C027	~
D3000	Top	J	8	PBFREEBGA40_64MB_66MHZ_MAX	FLASH 4MX16 1.8/1.8V FBGA44 PBFREE	4Mx16
D3001	Top	G	5	WBGA_60_8.1X6.6_H0.9	SDRAM 4X16 1.8V/1.8V FBGA60 PBFREE	4Mx16
D4400	Top	G	2	FCBGA121_8.2X8.2	LCD CONTROLLER S1D13743 1.8V FBGA121	~
D4800	Top	J	6	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~
D5000	Top	J	3	FBGA133_11.6X13.1	COMBO 512 DDR + 1G NAND FBGA133 PBFREE	32Mx16 / 128Mx8
D6030	Bottom	K	5	XBGA_N5_H0.625	OR-GATE 2INPUT 74LVC1G32YZTR WCSP-5	~
F2000	Bottom	U	4	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A
G2200	Bottom	J	1	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V
G6030	Bottom	K	7	VCTCXO_3.4X2.7_4P2_H1.0	TCXO 38.4MHZ +-10PPM 2.78V	38.4MHz

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Item	Side	Grid		Description and value		
G7500	Top	D	2	VCO_FDK_IT_H1.7	VCO 3610-4340MHZ 2.7V 14MA	3610-4340MHz
G7501	Top	D	5	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz
G7502	Bottom	E	6	VCO_FDK_IT_4	VCO 3296-3980MHZ FOUR 2.7V 20MA	3296-3980MHz
L1470	Bottom	F	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L1472	Bottom	I	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L2000	Bottom	U	4	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2001	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2002	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2003	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2070	Bottom	I	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2100	Top	F	3	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2101	Bottom	F	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2102	Bottom	F	6	COIL_0603CS	CHIP COIL 33N G Q40/250MHZ 0603	33nH
L2103	Bottom	G	6	COIL_0603CS	CHIP COIL 33N G Q40/250MHZ 0603	33nH
L2104	Bottom	F	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2105	Bottom	I	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2106	Bottom	H	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2202	Bottom	D	2	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2203	Bottom	D	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz

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Item	Side	Grid		Description and value		
L2204	Bottom	D	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2205	Bottom	Q	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2206	Bottom	J	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2301	Bottom	T	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2302	Bottom	T	7	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH
L2304	Bottom	Q	8	CHOKE_SER300_ H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH
L4200	Top	H	5	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH
L4201	Top	I	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L4401	Top	F	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4402	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4403	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4404	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4405	Top	G	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4406	Top	G	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4407	Top	G	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L5200	Bottom	Q	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L6030	Bottom	L	7	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L6031	Bottom	L	7	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H
L7502	Top	C	6	0402L	CHIP COIL 100N J Q16/300M 0402	100nH
L7503	Bottom	G	8	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz

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Item	Side	Grid		Description and value		
L7504	Bottom	C	3	0402L	CHIP COIL 27N J Q27/800M 0402	27nH
L7505	Bottom	C	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7506	Bottom	C	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7510	Top	D	8	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H
L7511	Top	D	7	0402L	CHIP COIL 10N J Q30/800M 0402	10nH
L7512	Top	D	7	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H
L7514	Bottom	D	8	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H
L7515	Bottom	F	9	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH
L7516	Bottom	C	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L7517	Top	D	6	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H
M2100	Bottom	H	2	VIBRA_M_KHN4N X1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~
N2200	Bottom	E	3	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~
N2300	Bottom	R	7	TFBGA_84_6.15X 6.15	TAHVO V5.2 LF TFBGA84	~
N2301	Bottom	Q	7	USMD8_1.69X1. 69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~
N4200	Top	H	4	USMD_10_2.458 X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~
N4202	Top	G	3	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~
N4203	Bottom	J	5	LLP_6	REG LP3981YDX-3.0 LLP3	~
N4400	Top	N	6	TSOP_6L_H1.1	HALL IC SWITCH TLE4917 TSSOP6	~
N4401	Bottom	K	9	CIM_138M7_T	IRDA 1.152 MBITS/S WITH LIFT PWB	~
N5200	Top	M	7	PBGA_N48	LEVEL SHIFT SN74AVCA406ZQCR 1.8/3V BGA48	~

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Item	Side	Grid		Description and value		
N6030	Bottom	L	6	uBGA63_4.6X4.6	BRF6150	~
N6031	Bottom	K	6	FC_4_0.99X0.99	LI VREG TK63128B 2.8V WLCSP4	~
N6300	Bottom	N	7	LFBGA_228	WLAN MCM STLC4370 F3 LINEAR EM LFBGA228	~
N6301	Bottom	L	8	RF5924	WLAN RF5924 ES3.5	~
N6302	Bottom	L	8	SOT_666	TRX2+RX4 PEMD9 N&P 10K/47K 0W12 SOT666	~
N7500	Top	D	4	TFBGA_84_6.15X 6.15	RF ASIC HINKU310A TFBGA84	~
N7501	Top	D	7	TFBGA64_H1.2	RF ASIC VINKU314A TFBGA64	~
N7502	Bottom	B	6	RITSA_PA_REL3	PW AMP RF9292E9.2 QUADBAND	~
N7503	Bottom	E	7	RF9252E2.1	PW AMP RF9252E8.2 1920-1980MHZ	~
N7504	Bottom	F	8	USMD10_2.534X 2.026	DC CONV SUPA LM2706 PBFREE	~
R1470	Top	J	7	0402R	Resistor 5% 63mW	100R
R1471	Top	J	7	0402R	Resistor 5% 63mW	100R
R1472	Bottom	G	5	0402R	Resistor 5% 63mW	3k3
R1473	Bottom	G	5	0402R	Resistor 5% 63mW	3k3
R1474	Bottom	I	6	0402R	Resistor 5% 63mW	33R
R2000	Bottom	V	5	0402R	Resistor 5% 63mW	220R
R2001	Bottom	U	5	uBGA11_2.15X1. 65	ASIP MIC W/ESD RES+CAP +ZDI BGA11	~
R2007	Bottom	T	7	uBGA11_1.6X2.1 5	ASIP SILIC USB OTG / ESD BGA11	~
R2009	Bottom	T	6	0402R	Resistor 5% 63mW	100R
R2010	Bottom	R	6	0402R	Resistor 5% 63mW	220k
R2011	Bottom	E	1	0402R	Resistor 5% 63mW	120k
R2012	Bottom	J	3	0402R	Resistor 5% 63mW	100k
R2013	Bottom	I	3	0402R	Resistor 5% 63mW	330R
R2014	Bottom	J	3	0402R	Resistor 5% 63mW	1M0
R2015	Bottom	V	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2070	Bottom	I	7	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V

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Item	Side	Grid		Description and value		
R2071	Bottom	T	6	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k
R2100	Bottom	S	6	FLIP_CHIP_8_1.7 X1.7	ASIP SINGLE ENDED MICROPHONE INTERF BGA8	~
R2101	Bottom	S	6	0402R	Resistor 5% 63mW	220R
R2102	Top	F	3	0402R	Chipres 0W06 jumper 0402	0R
R2103	Top	F	3	0402R	Chipres 0W06 jumper 0402	0R
R2104	Top	F	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2105	Top	F	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2106	Bottom	F	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2107	Bottom	G	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2200	Bottom	F	2	0402R	Resistor 5% 63mW	100k
R2201	Bottom	D	1	0402R	Resistor 5% 63mW	120k
R2202	Bottom	F	3	0402R	Resistor 5% 63mW	47R
R2203	Bottom	G	2	0402R	Resistor 5% 63mW	470R
R2205	Bottom	E	1	0402R	CHIPRES 0W06 2M2 J 0402	2M2
R2206	Bottom	D	2	0402R	Resistor 5% 63mW	4k7
R2304	Bottom	Q	6	0402R	Resistor 5% 63mW	33R
R2306	Bottom	Q	7	0402R	Chipres 0W06 jumper 0402	0R
R2307	Bottom	S	8	0402R	Resistor 5% 63mW	100R
R2700	Bottom	L	4	uBGA8_1.47X1.47	ASIP SIM INTERFACE **LOW CAP**BGA8	~
R3000	Bottom	I	1	0402R	Resistor 5% 63mW	4k7
R4200	Bottom	I	6	0402R	Resistor 5% 63mW	220k
R4414	Bottom	D	1	0402R	Resistor 5% 63mW	470k
R4415	Top	A	3	0402R	Resistor 5% 63mW	100k
R4416	Top	A	2	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k
R4417	Top	A	3	0402R	Resistor 5% 63mW	470k
R4418	Top	F	6	0402R	Resistor 5% 63mW	1k0
R4419	Top	F	7	0402R	Resistor 5% 63mW	100k

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Item	Side	Grid		Description and value		
R4420	Top	M	6	0402R	Resistor 5% 63mW	100R
R4423	Bottom	J	9	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7
R4424	Top	N	3	0402R	Resistor 5% 63mW	10k
R4425	Top	L	4	0402R	Resistor 5% 63mW	10k
R4426	Top	H	3	0402R	Resistor 5% 63mW	1k0
R4427	Bottom	D	3	0402R	Resistor 5% 63mW	4k7
R4428	Top	F	6	0402R	Resistor 5% 63mW	4k7
R4429	Top	L	6	0402R	Resistor 5% 63mW	100k
R4432	Top	F	7	0402R	Chipres 0W06 jumper 0402	0R
R4433	Top	F	8	0402R	Resistor 5% 63mW	1k0
R4434	Top	F	8	0402R	Resistor 5% 63mW	1k0
R4435	Top	F	8	0402R	Resistor 5% 63mW	47R
R4436	Top	F	8	0402R	Resistor 5% 63mW	10R
R4439	Top	F	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R4440	Top	F	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R4441	Top	H	6	0402R	Resistor 5% 63mW	100R
R4442	Top	H	2	0402R	Resistor 5% 63mW	100R
R4445	Top	N	3	0402R	Chipres 0W06 jumper 0402	0R
R4800	Top	J	4	0402R	Resistor 5% 63mW	10R
R4809	Top	L	6	0402R	Resistor 5% 63mW	1k0
R4810	Top	I	6	0402R	Resistor 5% 63mW	10k
R4811	Bottom	J	6	0402R	Resistor 5% 63mW	47R
R4812	Bottom	J	6	0402R	Resistor 5% 63mW	47R
R5200	Bottom	Q	6	0402R	Resistor 5% 63mW	12k
R5201	Bottom	R	6	0402R	Resistor 5% 63mW	56R
R5202	Bottom	R	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R5208	Bottom	P	6	0402R	Resistor 5% 63mW	100k
R5210	Bottom	P	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R5211	Bottom	Q	6	0402R	Resistor 5% 63mW	100k
R6054	Bottom	L	6	0402R	Resistor 5% 63mW	100k

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Item	Side	Grid		Description and value		
R6055	Bottom	L	5	0402R	Resistor 5% 63mW	100k
R6065	Top	L	5	0402R	Resistor 5% 63mW	10k
R6300	Bottom	O	8	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0
R6301	Bottom	O	6	0402R	Resistor 5% 63mW	1k2
R6354	Bottom	N	6	0402R	Resistor 5% 63mW	3k3
R6424	Bottom	K	7	0402R	Resistor 5% 63mW	100R
R7400	Top	E	4	0402R	Resistor 5% 63mW	18R
R7401	Bottom	F	6	0402R	Resistor 5% 63mW	10R
R7402	Top	E	3	0402R	Resistor 5% 63mW	10R
R7501	Top	E	2	0402R	Resistor 5% 63mW	1k0
R7503	Bottom	E	4	0402R	Resistor 5% 63mW	4k7
R7504	Top	E	4	0402R	CHIPRES 0W06 10K F 0402	10k
R7505	Top	C	2	0402R	CHIPRES 0W06 8K2 F 0402	8k2
R7506	Bottom	C	5	0402R	Resistor 5% 63mW	270R
R7509	Top	E	5	0402R	Resistor 5% 63mW	22k
R7512	Bottom	B	7	0404_RAC10	RES NETWORK 0W04 2DB ATT 0404	436R/ 11R6/43 6R
R7514	Top	E	7	0402R	Resistor 5% 63mW	12k
R7516	Bottom	C	5	0402R	Resistor 5% 63mW	1k0
R7518	Top	C	8	0402R	Resistor 5% 63mW	470k
R7519	Bottom	D	5	0402R	Resistor 5% 63mW	1k0
R7520	Top	D	7	0402R	Resistor 5% 63mW	270R
R7521	Top	E	7	0402R	CHIPRES 0W06 10K F 0402	10k
R7522	Top	C	7	0402R	Resistor 5% 63mW	220k
R7523	Top	C	6	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1
R7525	Bottom	F	7	0402R	Resistor 5% 63mW	10R
R7526	Bottom	E	8	0402R	Resistor 5% 63mW	5k6
R7527	Bottom	E	8	0402R	Resistor 5% 63mW	220R
R7528	Top	C	8	0402R	Resistor 5% 63mW	470k
R7529	Bottom	E	8	0402R	Resistor 5% 63mW	2k2
R7530	Bottom	E	7	0402R	Resistor 5% 63mW	8k2
R7531	Bottom	E	7	0402R	Resistor 5% 63mW	8k2
R7534	Top	C	8	0402R	Resistor 5% 63mW	470k

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Item	Side	Grid		Description and value		
S4429	Top	M	5	SWITCH_EVQWHE50K	SWITCH MULTIDIRECTIONAL EVQ042Z5003	~
S4436	Top	A	7	BUTTON_EVPAA	SWITCH PB LIGHT EVPAA 15V 20MA	~
S4437	Bottom	L	1	SWITCH_SKRELX1_1	SM SW TACT SPST-NO 12VDC 50MA	~
T6030	Bottom	L	7	TRANS_LDB213	TRANSF BALUN 2400 +-100MHZ	~
T7500	Top	D	5	TRANS_LDB15	TRANSF BALUN 2134 +-90MHZ 0805	~
T7501	Top	C	3	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~
T7502	Bottom	C	7	TRANS_LDB15	TRANSF BALUN 1800 +-100mhz 2x1.25	~
T7503	Bottom	D	6	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~
V2000	Bottom	U	5	CASE_457	TVS DI 1PMT16AT3 16V 175W PWRMITE	~
V2001	Bottom	I	3	VMT3_R	MOSFET N 30V 100MA VMT3	~
V2302	Bottom	S	8	SOD323F	SCH DI 30V 2A SOD323F	~
V4400	Top	N	8	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~
V4401	Top	U	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4402	Top	U	2	LED_LWL28G	LED LW L28G WHITE 0603	~
V4403	Top	R	8	LED_LWL28G	LED LW L28G WHITE 0603	~
V4404	Top	N	2	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~
V4405	Top	P	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4406	Top	U	7	LED_LWL28G	LED LW L28G WHITE 0603	~
V4407	Top	R	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4408	Top	F	8	SOT_666	TRX2 N 15V 1A 0W3 LOWSAT SOT666	~
V4409	Top	F	8	SOT_666	TRX2 N 15V 1A 0W3 LOWSAT SOT666	~
V4410	Top	A	3	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~

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Item	Side	Grid		Description and value		
V4411	Top	F	7	SC70_6_FAIR	MFET N&P SI1867DL VIN>1V8 SOT363	~
V4412	Top	P	8	LED_LWL28G	LED LW L28G WHITE 0603	~
V4413	Top	F	9	SC79	SCH DI 1PS79SB31 200MA 30V SOD523	~
V4414	Top	F	7	SC79	SCH DI 1PS79SB31 200MA 30V SOD523	~
V7500	Bottom	E	8	SOT_563	SCHDIX2 RF DETECTOR CT 1PF 0V39 SOT666	~
X1470	Bottom	H	4	SOCKET_DMD10413	CAMERA MOD.SOCKET 2X7POL SPR P1.4	~
X2001	Bottom	V	6	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~
X2002	Bottom	V	3	CONTACT_PAD_2.95X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
X2003	Bottom	V	3	CONTACT_PAD_2.95X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
X2060	Top	E	8	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~
X2070	Bottom	I	7	LYNX_BATT_CONN_H7.0	SM BATTERY CONN 3POL SPR 12V 2A	~
X2105	Bottom	H	7	DMD05906	RF-SPACER DMD05906 HD986-TRI	~
X2106	Bottom	G	6	DMD05906	RF-SPACER DMD05906 HD986-TRI	~
X2700	Bottom	M	3	SIM_CONN_P04_100157_001	SM SIM CONN 2X3POL P2.54 50V 0.5A	~
X4401	Top	B	3	JST_CO3_00352_200_MIRROR	SM CONN PORTABLE 2X20 P0.4PWB SMD	~
X4402	Top	M	4	CFX3103_0101E	SM COAX CONN RECEP 1X3PIN P0.5	~
X5200	Bottom	S	3	MINISD_SC1S011V1S3	CONN MINISD PUSH-PUSH 3.3V 0.5A	~
X6300	Bottom	O	9	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~
X7500	Bottom	A	3	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7501	Bottom	A	2	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7502	Bottom	C	3	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~

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Item	Side	Grid		Description and value		
X7503	Bottom	C	8	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~
X7504	Bottom	A	8	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7505	Bottom	A	8	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7506	Bottom	B	1	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
Z2000	Bottom	T	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2001	Bottom	T	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2003	Bottom	T	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2004	Bottom	U	6	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~
Z4400	Top	N	7	uBGA24_2.62X2.62	ASIP EMIF10-1K010F2 **PB-FREE**	~
Z4402	Top	N	4	uBGA24_2.62X2.62	ASIP EMIF10-1K010F2 **PB-FREE**	~
Z4403	Top	F	2	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z4404	Top	F	3	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z4405	Top	F	2	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z5200	Bottom	Q	6	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~
Z6300	Bottom	K	8	FILTER_LFB322G	CER FILT 2450+-50MHZ 3.2X2.5	2450MHz
Z7500	Bottom	H	8	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz
Z7501	Top	C	4	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 2140+-30MHZ 2.0X1.6X1.0	2140MHz
Z7502	Top	D	8	DFYK61G95LBJCB	DUPL 1920-1980/2110-2170MHZ 9X4.3	1920-1980/2110-2170MHz
Z7503	Bottom	B	4	ANT_SW_M043B	ANT.SW+3SAW 880-960/1710-1990MHZ	~
Z7504	Bottom	B	7	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 897.5 +-17.5MHZ 2.0X1.6	897.5MHz

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Item	Side	Grid		Description and value		
Z7505	Bottom	E	9	ISOLATOR_CEZ0047	ISOLATOR 1950+-30MHZ 13DB 3.3X3.4X1.6	~
Z7506	Top	E	7	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 1950+-30MHZ 2.0X1.6X1.0	1950MHz

Table 1 Component parts list (1 em-25b)

Item	Side	Grid		Description and value		
A2100	Bottom	U	7	1EM_RIGID	PWB RIGID 1EM_LIFTING	~
A2200	Bottom	E	3	SHIELD_040_011760	RETU CAN 040-011760	~
A2300	Bottom	S	7	SHIELD_040_011763	TAHVO CAN 040-011763	~
A4100	Top	I	3	SHIELD_040_014599	COMBO SHIELD 040-014599	~
A4200	Top	I	7	SHIELD_040_003608	BB CAN 040-003608	~
A6000	Bottom	N	7	SHIELD_040_011766	WLAN-BT CAN 040-011766	~
A7001	Bottom	E	8	SHIELD_DMC07007	WDCMA PA CAN DMC07007 RM-1	~
A7002	Bottom	B	5	SHIELD_DMC07005	GSM PA CAN DMC07005 RM-1	~
A7003	Bottom	E	6	SHIELD_DMD11427	VCO CAN DMD11427 RM-1	~
A7004	Top	D	7	SHIELD_040_014600	VINKU SHIELD 040-014600	~
A7005	Top	D	3	SHIELD_040_005293	RF ENGINE CAN 040-005293	~
B2200	Bottom	E	2	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz
C1470	Bottom	G	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1471	Bottom	J	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2000	Bottom	U	5	0402C	Chipcap 5% NP0	27p
C2002	Bottom	V	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2003	Bottom	U	5	0402C	CERCAP X7R 22N K 16V 0402	22n

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Item	Side	Grid		Description and value		
C2004	Bottom	U	5	0402C	CERCAP X7R 22N K 16V 0402	22n
C2005	Bottom	U	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2006	Bottom	U	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2011	Bottom	T	7	0402C	CHIPCAP NP0 270P J 25V 0402	270p
C2012	Bottom	V	4	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n
C2071	Bottom	D	2	0402C	Chipcap 5% NP0	27p
C2072	Bottom	H	6	0402C	Chipcap 5% NP0	10p
C2073	Bottom	H	6	0402C	Chipcap 5% NP0	10p
C2100	Bottom	T	6	0402C	CHIPCAP X7R 15N K 16V 0402	15n
C2101	Bottom	T	6	0402C	CHIPCAP X7R 15N K 16V 0402	15n
C2102	Bottom	S	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2103	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C2104	Top	F	4	0402C	Chipcap X7R 10% 50V 0402	1n0
C2105	Bottom	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2106	Bottom	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2107	Bottom	G	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2108	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2109	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2110	Bottom	H	1	0402C	Chipcap X7R 10% 50V 0402	1n0
C2200	Bottom	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2201	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2202	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0

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Item	Side	Grid		Description and value		
C2203	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2204	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2205	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2206	Bottom	F	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2207	Bottom	D	2	0402C	Chipcap X7R 10% 50V 0402	1n0
C2208	Bottom	E	1	0402C	Chipcap 5% NP0	27p
C2209	Bottom	E	1	0402C	Chipcap 5% NP0	22p
C2210	Bottom	D	4	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C2211	Bottom	E	4	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2212	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2213	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2214	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2215	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2216	Bottom	F	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2217	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2219	Bottom	E	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2220	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2221	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2222	Bottom	E	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2223	Bottom	G	3	0402C	Chipcap X7R 10% 16V 0402	10n
C2224	Bottom	G	3	0402C	Chipcap X7R 10% 16V 0402	10n

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Item	Side	Grid		Description and value		
C2225	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2226	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2227	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2228	Bottom	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2230	Bottom	D	1	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2231	Bottom	F	4	0805C	CHIPCAP X5R 10U M 6V3 0805	10U
C2232	Bottom	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2233	Bottom	J	1	0402C	Chipcap 5% NP0	27p
C2237	Bottom	D	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2238	Bottom	F	3	0402C	Chipcap 5% NP0	27p
C2239	Bottom	F	3	0402C	Chipcap 5% NP0	27p
C2300	Bottom	S	8	0402C	Chipcap X7R 10% 16V 0402	10n
C2301	Bottom	T	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2302	Bottom	S	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2303	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2304	Bottom	S	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2306	Bottom	T	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2307	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2309	Bottom	T	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2312	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2313	Bottom	R	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2314	Bottom	Q	8	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7

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Item	Side	Grid		Description and value		
C2315	Bottom	Q	7	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2316	Bottom	S	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2317	Bottom	S	8	0402C	Chipcap 5% NP0	27p
C2701	Bottom	O	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2800	Top	H	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2801	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2802	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2803	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2804	Top	G	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2805	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2806	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2807	Bottom	G	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2808	Bottom	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2809	Top	H	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2810	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2811	Top	I	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2812	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2813	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2814	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2815	Top	I	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2830	Top	H	9	0402C	Chipcap 5% NP0	10p

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Item	Side	Grid		Description and value		
C3000	Bottom	I	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3001	Bottom	J	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3002	Bottom	J	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3003	Top	I	8	0402C	Chipcap X7R 10% 16V 0402	10n
C3004	Top	F	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3005	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3006	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3007	Top	G	6	0402C	Chipcap X7R 10% 16V 0402	10n
C3008	Top	G	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3100	Bottom	M	5	0402C	Chipcap 5% NP0	27p
C4200	Top	H	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4201	Top	H	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4202	Top	I	3	0402C	Chipcap X7R 10% 16V 0402	10n
C4206	Top	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4207	Top	G	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4208	Bottom	J	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C4209	Bottom	I	6	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C4210	Bottom	I	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C4405	Top	F	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4406	Top	L	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4407	Top	F	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0

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Item	Side	Grid		Description and value		
C4409	Bottom	J	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C4410	Bottom	J	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4412	Top	L	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C4413	Top	B	7	0402C	Chipcap 5% NP0	27p
C4414	Top	H	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4415	Top	G	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4416	Top	G	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4417	Top	H	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4418	Bottom	G	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4419	Top	G	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C4420	Top	H	3	0402C	Chipcap X7R 10% 50V 0402	1n0
C4421	Top	H	6	0402C	Chipcap 5% NP0	27p
C4422	Top	I	2	0402C	Chipcap 5% NP0	27p
C4800	Top	J	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4801	Top	K	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4802	Top	I	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4803	Top	I	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4804	Top	I	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4805	Top	J	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4806	Top	J	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4807	Top	L	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4808	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n

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Item	Side	Grid		Description and value		
C4809	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4810	Top	I	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4811	Bottom	G	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4812	Top	I	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C4813	Top	L	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C5000	Bottom	J	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5001	Bottom	J	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5002	Bottom	J	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5003	Top	K	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5004	Bottom	J	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5005	Top	I	1	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C5006	Bottom	J	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C5200	Bottom	R	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C5201	Top	L	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C5202	Top	M	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6030	Bottom	K	6	0402C	Chipcap 5% NP0	100p
C6031	Bottom	L	7	0402C	Chipcap 5% NP0	15p
C6033	Bottom	K	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6036	Bottom	L	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6037	Bottom	L	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6038	Bottom	L	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0

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Item	Side	Grid		Description and value		
C6039	Bottom	K	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6040	Bottom	K	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6041	Bottom	K	6	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6042	Bottom	L	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6043	Bottom	L	7	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6044	Bottom	K	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6045	Bottom	K	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C6051	Bottom	K	6	0402C	Chipcap 5% NP0	10p
C6300	Bottom	P	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C6301	Bottom	P	6	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C6302	Bottom	P	8	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C6303	Bottom	P	7	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C6304	Bottom	P	8	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6305	Bottom	P	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6307	Bottom	O	8	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6308	Bottom	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6309	Bottom	M	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6310	Bottom	M	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6311	Bottom	M	6	0402C	chipcap x7r 47n k 10v 0402	47n
C6312	Bottom	M	8	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C6313	Bottom	M	6	0402C	Chipcap X7R 10% 50V 0402	1n0

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Item	Side	Grid		Description and value		
C6314	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6315	Bottom	N	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6317	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6318	Bottom	N	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6319	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6320	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6321	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6322	Bottom	P	7	0402C	Chipcap X7R 10% 50V 0402	1n0
C6323	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6324	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6325	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6326	Bottom	O	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C6327	Bottom	O	6	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6330	Bottom	K	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6335	Bottom	L	8	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6338	Bottom	K	8	0402C	Chipcap 5% NP0	47p
C6340	Bottom	L	8	0402C	Chipcap +-0.25pF NP0	6p8
C6344	Bottom	M	7	0402C	Chipcap +-0.25pF NP0	6p8
C6345	Bottom	M	7	0402C	Chipcap +-0.25pF NP0	6p8
C6346	Bottom	O	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6347	Bottom	O	6	0402C	Chipcap 5% NP0	82p
C6348	Bottom	N	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0

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Item	Side	Grid		Description and value		
C6351	Bottom	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C6352	Bottom	N	6	0402C	Chipcap 5% NP0	150p
C6360	Bottom	M	8	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6361	Bottom	M	6	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6364	Bottom	L	7	0402C	Chipcap +-0.25pF NP0	6p8
C6365	Bottom	L	7	0402C	Chipcap +-0.25pF NP0	6p8
C6366	Bottom	K	7	0402C	Chipcap +-0.25pF NP0	6p8
C6367	Bottom	K	7	0402C	Chipcap +-0.25pF NP0	6p8
C6410	Bottom	N	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C7400	Bottom	G	8	0402C	Chipcap 5% NP0	18p
C7401	Bottom	C	9	0402C	Chipcap +-0.25pF NP0	2p2
C7403	Bottom	F	5	0402C	Chipcap 5% NP0	18p
C7404	Bottom	F	5	0402C	Chipcap +-0.25pF NP0	2p7
C7405	Bottom	D	4	0402C	Chipcap 5% NP0	18p
C7407	Top	E	4	0402C	Chipcap X7R 5% 16V 0402	10n
C7501	Top	E	4	0402C	Chipcap 5% NP0	18p
C7503	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7504	Bottom	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7505	Top	C	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C7507	Top	C	4	0402C	Chipcap 5% NP0	18p
C7508	Top	C	5	0402C	Chipcap 5% NP0	18p
C7509	Top	C	4	0402C	Chipcap +-0.25pF NP0	2p7
C7512	Bottom	C	3	0402C	Chipcap +-0.25pF NP0	2p7
C7513	Top	D	3	0402C	Chipcap X7R 10% 25V 0402	4n7
C7514	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	2p7
C7515	Top	E	3	0402C	Chipcap 5% NP0	10p
C7516	Top	E	2	0402C	Chipcap 5% NP0	150p
C7518	Bottom	E	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n

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Item	Side	Grid		Description and value		
C7520	Top	E	4	0402C	Chipcap 5% NP0	18p
C7522	Top	D	3	0402C	Chipcap 5% NP0	150p
C7523	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	3p9
C7524	Top	C	2	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2
C7525	Bottom	C	5	0402C	Chipcap +-0.25pF NP0	3p9
C7526	Top	E	5	0402C	Chipcap +-0.25pF NP0	5p6
C7527	Top	C	3	0402C	Chipcap 5% NP0	100p
C7528	Top	H	9	0402C	Chipcap 5% NP0	22p
C7529	Top	D	5	0402C	Chipcap 5% X7R	1n0
C7530	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7531	Top	H	9	0402C	Chipcap 5% NP0	22p
C7532	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7533	Top	D	5	0402C	Chipcap X7R 5% 16V 0402	10n
C7534	Top	E	3	0402C	Chipcap X7R 10% 16V 0402	8n2
C7536	Top	E	4	0402C	Chipcap X7R 10% 16V 0402	8n2
C7540	Top	E	6	0402C	Chipcap 5% NP0	18p
C7541	Top	E	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7542	Top	E	7	0402C	Chipcap 5% NP0	18p
C7543	Top	E	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7545	Bottom	A	6	0402C	Chipcap +-0.25pF NP0	4p7
C7547	Top	D	6	0402C	Chipcap +-0.25pF NP0	1p8
C7548	Top	E	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7549	Top	E	7	0402C	Chipcap 5% NP0	100p
C7550	Top	C	6	0402C	Chipcap +-0.25pF NP0	2p7
C7552	Top	C	6	0402C	Chipcap +-0.25pF NP0	2p7
C7553	Top	C	6	0402C	Chipcap X7R 10% 16V 0402	8n2
C7554	Bottom	F	6	0402C	Chipcap +-0.25pF NP0	4p7
C7555	Bottom	F	6	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5

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Item	Side	Grid		Description and value		
C7556	Bottom	C	6	0402C	Chipcap 5% NP0	10p
C7559	Bottom	C	5	0402C	Chipcap +-0.25pF NP0	1p0
C7560	Top	C	6	0402C	Chipcap X7R 10% 25V 0402	4n7
C7561	Bottom	C	6	0402C	Chipcap +-0.25pF NP0	4p7
C7563	Bottom	C	6	0402C	Chipcap +-0.25pF NP0	4p7
C7564	Bottom	B	5	0402C	Chipcap 5% X7R	1n0
C7568	Top	C	6	0402C	Chipcap 5% NP0	150p
C7569	Bottom	B	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7570	Top	D	6	0402C	Chipcap 5% NP0	18p
C7571	Bottom	F	6	0402C	CHIPCAP NP0 330P J 50V 0402	330p
C7573	Top	C	6	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2
C7575	Top	C	7	0402C	Chipcap 5% NP0	15p
C7577	Top	D	7	0402C	Chipcap 5% NP0	15p
C7581	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	4p7
C7582	Top	C	6	0402C	Chipcap 5% NP0	100p
C7584	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	4p7
C7593	Bottom	C	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7596	Top	D	4	0402C	Chipcap +-0.25pF NP0	2p7
C7597	Bottom	I	9	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V
C7598	Top	D	3	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5
D2800	Top	G	7	uBGA_289	RAP3G V2.20E-PA UMC8D F761800F 12C027	~
D3000	Top	J	8	PBFREEBGA40_64MB_66MHZ_MAX	FLASH 4MX16 1.8/1.8V FBGA44 PBFREE	4Mx16
D3001	Top	G	5	WBGA_60_8.1X6.6_H0.9	SDRAM 4X16 1.8V/1.8V FBGA60 PBFREE	4Mx16
D4400	Top	G	2	FCBGA121_8.2X8.2	LCD CONTROLLER S1D13743 1.8V FBGA121	~
D4800	Top	J	6	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~

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Item	Side	Grid		Description and value		
D5000	Top	J	3	FBGA133_11.6X 13.1	COMBO 512 DDR + 1G NAND FBGA133 PBFREE	32Mx16/ 128Mx8
D6030	Bottom	K	5	XBGA_N5_H0.62 5	OR-GATE 2INPUT 74LVC1G32YZTR WCSP-5	~
F2000	Bottom	U	4	0603_FUSE_AVX 2MATS	SM FUSE F 2.0A 32V	2A
G2200	Bottom	J	1	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V
G6030	Bottom	K	7	VCTCXO_3.4X2.7 _4P2_H1.0	TCXO 38.4MHZ +-10PPM 2.78V	38.4MHz
G7500	Top	D	2	VCO_FDK_IT_H1. 7	VCO 3610-4340MHZ 2.7V 14MA	3296-39 80MHz
G7501	Top	D	5	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz
G7502	Bottom	E	6	VCO_FDK_IT_4	VCO 3296-3980MHZ FOUR 2.7V 20MA	3296-39 80MHz
L1470	Bottom	F	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L1472	Bottom	I	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2000	Bottom	U	4	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2001	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R /100MHz
L2002	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R /100MHz
L2003	Bottom	U	6	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R /100MHz
L2070	Bottom	I	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2100	Top	F	3	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R /100MHz
L2101	Bottom	F	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2102	Bottom	F	6	COIL_0603CS	CHIP COIL 33N G Q40/250MHZ 0603	33nH
L2103	Bottom	G	6	COIL_0603CS	CHIP COIL 33N G Q40/250MHZ 0603	33nH
L2104	Bottom	F	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2105	Bottom	I	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz

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Item	Side	Grid		Description and value		
L2106	Bottom	H	1	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2202	Bottom	D	2	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2203	Bottom	D	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2204	Bottom	D	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2205	Bottom	Q	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2206	Bottom	J	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L2301	Bottom	T	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L2302	Bottom	T	7	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH
L2304	Bottom	Q	8	CHOKE_SER300_ H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH
L4200	Top	H	5	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH
L4201	Top	I	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz
L4401	Top	F	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4402	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4403	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4404	Top	N	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L4405	Top	G	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4406	Top	G	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L4407	Top	G	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L5200	Bottom	Q	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L6030	Bottom	L	7	0402L	CHIP COIL 22N J Q28/800M 0402	22nH

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Item	Side	Grid		Description and value		
L6031	Bottom	L	7	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H
L7502	Top	C	6	0402L	CHIP COIL 100N J Q16/300M 0402	100nH
L7503	Bottom	G	8	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L7504	Bottom	C	3	0402L	CHIP COIL 27N J Q27/800M 0402	27nH
L7505	Bottom	C	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7506	Bottom	C	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7516	Bottom	C	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz
L7517	Top	D	6	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H
M2100	Bottom	H	2	VIBRA_M_KHN4N X1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~
N2200	Bottom	E	3	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~
N2300	Bottom	R	7	TFBGA_84_6.15X 6.15	TAHVO V5.2 LF TFBGA84	~
N2301	Bottom	Q	7	USMD8_1.69X1. 69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~
N4200	Top	H	4	USMD_10_2.458 X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~
N4202	Top	G	3	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~
N4203	Bottom	J	5	LLP_6	REG LP3981YDX-3.0 LLP3	~
N4400	Top	N	6	TSOP_6L_H1.1	HALL IC SWITCH TLE4917 TSSOP6	~
N4401	Bottom	K	9	CIM_138M7_T	IRDA 1.152 MBITS/S WITH LIFT PWB	~
N5200	Top	M	7	PBGA_N48	LEVEL SHIFT SN74AVCA406ZQCR 1.8/3V BGA48	~
N6030	Bottom	L	6	uBGA63_4.6X4.6	BRF6150	~
N6031	Bottom	K	6	FC_4_0.99X0.99	LI VREG TK63128B 2.8V WLCSP4	~

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Item	Side	Grid		Description and value		
N6300	Bottom	N	7	LFBGA_228	WLAN MCM STLC4370 F3 LINEAR EM LFBGA228	~
N6301	Bottom	L	8	RF5924	WLAN RF5924 ES3.5	~
N6302	Bottom	L	8	SOT_666	TRX2+RX4 PEMD9 N&P 10K/47K 0W12 SOT666	~
N7500	Top	D	4	TFBGA_84_6.15X 6.15	RF ASIC HINKU310A TFBGA84	~
N7501	Top	D	7	TFBGA64_H1.2	RF ASIC VINKU314A TFBGA64	~
N7502	Bottom	B	6	RITSA_PA_REL3	PW AMP RF9292E9.2 QUADBAND	~
R1470	Top	J	7	0402R	Resistor 5% 63mW	100R
R1471	Top	J	7	0402R	Resistor 5% 63mW	100R
R1472	Bottom	G	5	0402R	Resistor 5% 63mW	3k3
R1473	Bottom	G	5	0402R	Resistor 5% 63mW	3k3
R1474	Bottom	I	6	0402R	Resistor 5% 63mW	33R
R2000	Bottom	V	5	0402R	Resistor 5% 63mW	220R
R2001	Bottom	U	5	uBGA11_2.15X1. 65	ASIP MIC W/ESD RES+CAP +ZDI BGA11	~
R2007	Bottom	T	7	uBGA11_1.6X2.1 5	ASIP SILIC USB OTG / ESD BGA11	~
R2009	Bottom	T	6	0402R	Resistor 5% 63mW	100R
R2010	Bottom	R	6	0402R	Resistor 5% 63mW	220k
R2011	Bottom	E	1	0402R	Resistor 5% 63mW	120k
R2012	Bottom	J	3	0402R	Resistor 5% 63mW	100k
R2013	Bottom	I	3	0402R	Resistor 5% 63mW	330R
R2014	Bottom	J	3	0402R	Resistor 5% 63mW	1M0
R2015	Bottom	V	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2070	Bottom	I	7	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2071	Bottom	T	6	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k
R2100	Bottom	S	6	FLIP_CHIP_8_1.7 X1.7	ASIP SINGLE ENDED MICROPHONE INTERF BGA8	~
R2101	Bottom	S	6	0402R	Resistor 5% 63mW	220R
R2102	Top	F	3	0402R	Chipres 0W06 jumper 0402	0R

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Item	Side	Grid		Description and value		
R2103	Top	F	3	0402R	Chipres 0W06 jumper 0402	0R
R2104	Top	F	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2105	Top	F	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2106	Bottom	F	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2107	Bottom	G	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2200	Bottom	F	2	0402R	Resistor 5% 63mW	100k
R2201	Bottom	D	1	0402R	Resistor 5% 63mW	120k
R2202	Bottom	F	3	0402R	Resistor 5% 63mW	47R
R2203	Bottom	G	2	0402R	Resistor 5% 63mW	470R
R2205	Bottom	E	1	0402R	CHIPRES 0W06 2M2 J 0402	2M2
R2206	Bottom	D	2	0402R	Resistor 5% 63mW	4k7
R2304	Bottom	Q	6	0402R	Resistor 5% 63mW	33R
R2306	Bottom	Q	7	0402R	Chipres 0W06 jumper 0402	0R
R2307	Bottom	S	8	0402R	Resistor 5% 63mW	100R
R2700	Bottom	L	4	uBGA8_1.47X1.47	ASIP SIM INTERFACE **LOW CAP**BGA8	~
R3000	Bottom	I	1	0402R	Resistor 5% 63mW	4k7
R4200	Bottom	I	6	0402R	Resistor 5% 63mW	220k
R4414	Bottom	D	1	0402R	Resistor 5% 63mW	470k
R4415	Top	A	3	0402R	Resistor 5% 63mW	100k
R4416	Top	A	2	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k
R4417	Top	A	3	0402R	Resistor 5% 63mW	470k
R4418	Top	F	6	0402R	Resistor 5% 63mW	1k0
R4419	Top	F	7	0402R	Resistor 5% 63mW	100k
R4420	Top	M	6	0402R	Resistor 5% 63mW	100R
R4423	Bottom	J	9	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7
R4424	Top	N	3	0402R	Resistor 5% 63mW	10k
R4425	Top	L	4	0402R	Resistor 5% 63mW	10k
R4426	Top	H	3	0402R	Resistor 5% 63mW	1k0

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Item	Side	Grid		Description and value		
R4427	Bottom	D	3	0402R	Resistor 5% 63mW	4k7
R4428	Top	F	6	0402R	Resistor 5% 63mW	4k7
R4429	Top	L	6	0402R	Resistor 5% 63mW	100k
R4432	Top	F	7	0402R	Chipres 0W06 jumper 0402	0R
R4433	Top	F	8	0402R	Resistor 5% 63mW	1k0
R4434	Top	F	8	0402R	Resistor 5% 63mW	1k0
R4435	Top	F	8	0402R	Resistor 5% 63mW	47R
R4436	Top	F	8	0402R	Resistor 5% 63mW	10R
R4439	Top	F	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R4440	Top	F	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R4441	Top	H	6	0402R	Resistor 5% 63mW	100R
R4442	Top	H	2	0402R	Resistor 5% 63mW	100R
R4445	Top	N	3	0402R	Chipres 0W06 jumper 0402	0R
R4800	Top	J	4	0402R	Resistor 5% 63mW	10R
R4809	Top	L	6	0402R	Resistor 5% 63mW	1k0
R4810	Top	I	6	0402R	Resistor 5% 63mW	10k
R4811	Bottom	J	6	0402R	Resistor 5% 63mW	47R
R4812	Bottom	J	6	0402R	Resistor 5% 63mW	47R
R5200	Bottom	Q	6	0402R	Resistor 5% 63mW	12k
R5201	Bottom	R	6	0402R	Resistor 5% 63mW	56R
R5202	Bottom	R	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R5208	Bottom	P	6	0402R	Resistor 5% 63mW	100k
R5210	Bottom	P	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R5211	Bottom	Q	6	0402R	Resistor 5% 63mW	100k
R6054	Bottom	L	6	0402R	Resistor 5% 63mW	100k
R6055	Bottom	L	5	0402R	Resistor 5% 63mW	100k
R6065	Top	L	5	0402R	Resistor 5% 63mW	10k
R6300	Bottom	O	8	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0
R6301	Bottom	O	6	0402R	Resistor 5% 63mW	1k2
R6354	Bottom	N	6	0402R	Resistor 5% 63mW	3k3

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Item	Side	Grid		Description and value		
R6424	Bottom	K	7	0402R	Resistor 5% 63mW	100R
R7400	Top	E	4	0402R	Resistor 5% 63mW	18R
R7401	Bottom	F	6	0402R	Resistor 5% 63mW	10R
R7402	Top	E	3	0402R	Resistor 5% 63mW	10R
R7501	Top	E	2	0402R	Resistor 5% 63mW	1k0
R7503	Bottom	E	4	0402R	Resistor 5% 63mW	4k7
R7504	Top	E	4	0402R	CHIPRES 0W06 10K F 0402	10k
R7505	Top	C	2	0402R	CHIPRES 0W06 8K2 F 0402	8k2
R7506	Bottom	C	5	0402R	Resistor 5% 63mW	270R
R7509	Top	E	5	0402R	Resistor 5% 63mW	22k
R7512	Bottom	B	7	0404_RAC10	RES NETWORK 0W04 2DB ATT 0404	436R/ 11R6/43 6R
R7514	Top	E	7	0402R	Resistor 5% 63mW	12k
R7516	Bottom	C	5	0402R	Resistor 5% 63mW	1k0
R7518	Top	C	8	0402R	Resistor 5% 63mW	470k
R7519	Bottom	D	5	0402R	Resistor 5% 63mW	1k0
R7521	Top	E	7	0402R	CHIPRES 0W06 10K F 0402	10k
R7523	Top	C	6	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1
R7528	Top	C	8	0402R	Resistor 5% 63mW	470k
R7534	Top	C	8	0402R	Resistor 5% 63mW	470k
R7535	Top	D	8	0402R	Chipres 0W06 jumper 0402	0R
R7536	Top	D	7	0402R	Chipres 0W06 jumper 0402	0R
R7537	Top	D	5	0402R	Chipres 0W06 jumper 0402	0R
R7538	Top	C	5	0402R	Chipres 0W06 jumper 0402	0R
S4429	Top	M	5	SWITCH_EVQWHE50K	SWITCH MULTIDIRECTIONAL EVQ042Z5003	~
S4436	Top	A	7	BUTTON_EVPAA	SWITCH PB LIGHT EVPAA 15V 20MA	~
S4437	Bottom	L	1	SWITCH_SKRELX1_1	SM SW TACT SPST-NO 12VDC 50MA	~

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Item	Side	Grid		Description and value		
T6030	Bottom	L	7	TRANS_LDB213	TRANSF BALUN 2400 +-100MHZ	~
T7501	Top	C	3	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~
T7502	Bottom	C	7	TRANS_LDB15	TRANSF BALUN 1800 +-100mhz 2x1.25	~
T7503	Bottom	D	6	TRANS_LDB15	TRANSF BALUN 3800 +-550MHZ 0805	~
V2000	Bottom	U	5	CASE_457	TVS DI 1PMT16AT3 16V 175W PWRMITE	~
V2001	Bottom	I	3	VMT3_R	MOSFET N 30V 100MA VMT3	~
V2302	Bottom	S	8	SOD323F	SCH DI 30V 2A SOD323F	~
V4400	Top	N	8	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~
V4401	Top	U	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4402	Top	U	2	LED_LWL28G	LED LW L28G WHITE 0603	~
V4403	Top	R	8	LED_LWL28G	LED LW L28G WHITE 0603	~
V4404	Top	N	2	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~
V4405	Top	P	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4406	Top	U	7	LED_LWL28G	LED LW L28G WHITE 0603	~
V4407	Top	R	4	LED_LWL28G	LED LW L28G WHITE 0603	~
V4408	Top	F	8	SOT_666	TRX2 N 15V 1A 0W3 LOWSAT SOT666	~
V4409	Top	F	8	SOT_666	TRX2 N 15V 1A 0W3 LOWSAT SOT666	~
V4410	Top	A	3	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~
V4411	Top	F	7	SC70_6_FAIR	MFET N&P SI1867DL VIN>1V8 SOT363	~
V4412	Top	P	8	LED_LWL28G	LED LW L28G WHITE 0603	~
V4413	Top	F	9	SC79	SCH DI 1PS79SB31 200MA 30V SOD523	~
V4414	Top	F	7	SC79	SCH DI 1PS79SB31 200MA 30V SOD523	~
X1470	Bottom	H	4	SOCKET_DMD10413	CAMERA MOD.SOCKET 2X7POL SPR P1.4	~

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Item	Side	Grid		Description and value		
X2001	Bottom	V	6	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~
X2002	Bottom	V	3	CONTACT_PAD_2.95X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
X2003	Bottom	V	3	CONTACT_PAD_2.95X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
X2060	Top	E	8	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~
X2070	Bottom	I	7	LYNX_BATT_CONN_H7.0	SM BATTERY CONN 3POL SPR 12V 2A	~
X2105	Bottom	H	7	DMD05906	RF-SPACER DMD05906 HD986-TRI	~
X2106	Bottom	G	6	DMD05906	RF-SPACER DMD05906 HD986-TRI	~
X2700	Bottom	M	3	SIM_CONN_P04_100157_001	SM SIM CONN 2X3POL P2.54 50V 0.5A	~
X4401	Top	B	3	JST_CO3_00352_200_MIRROR	SM CONN PORTABLE 2X20 P0.4PWB SMD	~
X4402	Top	M	4	CFX3103_0101E	SM COAX CONN RECEP 1X3PIN P0.5	~
X5200	Bottom	S	3	MINISD_SC1S011V1S3	CONN MINISD PUSH-PUSH 3.3V 0.5A	~
X6300	Bottom	O	9	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~
X7500	Bottom	A	3	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7501	Bottom	A	2	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
X7502	Bottom	C	3	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~
X7506	Bottom	B	1	ANT_SPRING_M3E_563	ANTENNA SPRING CLIP	~
Z2000	Bottom	T	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2001	Bottom	T	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2003	Bottom	T	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2004	Bottom	U	6	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~

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Item	Side	Grid		Description and value		
Z4400	Top	N	7	uBGA24_2.62X2.62	ASIP EMIF10-1K010F2 **PB-FREE**	~
Z4402	Top	N	4	uBGA24_2.62X2.62	ASIP EMIF10-1K010F2 **PB-FREE**	~
Z4403	Top	F	2	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z4404	Top	F	3	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z4405	Top	F	2	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z5200	Bottom	Q	6	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~
Z6300	Bottom	K	8	FILTER_LFB322G	CER FILT 2450+-50MHZ 3.2X2.5	2450MHz
Z7500	Bottom	H	8	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz
Z7502	Top	D	8	DFYK61G95LBJCB	DUPL 1920-1980/2110-2170MHZ 9X4.3	1920-1980/2110-2170MHz
Z7503	Bottom	B	4	ANT_SW_M043B	ANT.SW+3SAW 880-960/1710-1990MHZ	~
Z7504	Bottom	B	7	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 897.5 +-17.5MHZ 2.0X1.6	836.5MHz

Component layouts

Component layouts - top 1em-25a and 1em-25b

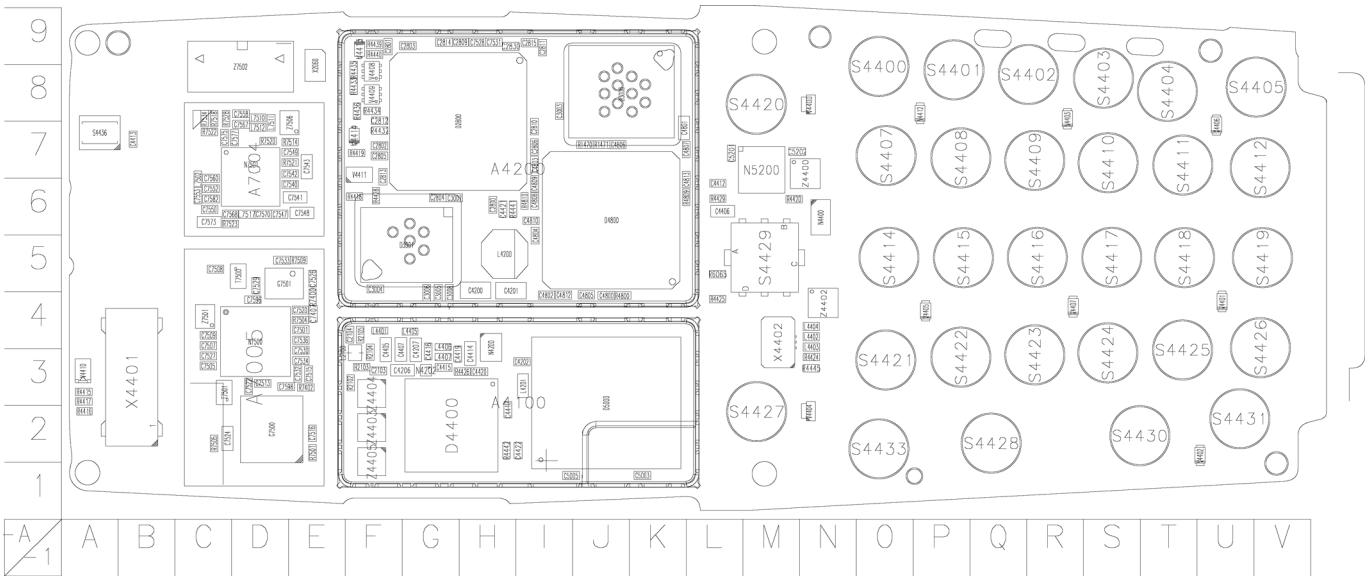

Figure 2 1em-25a

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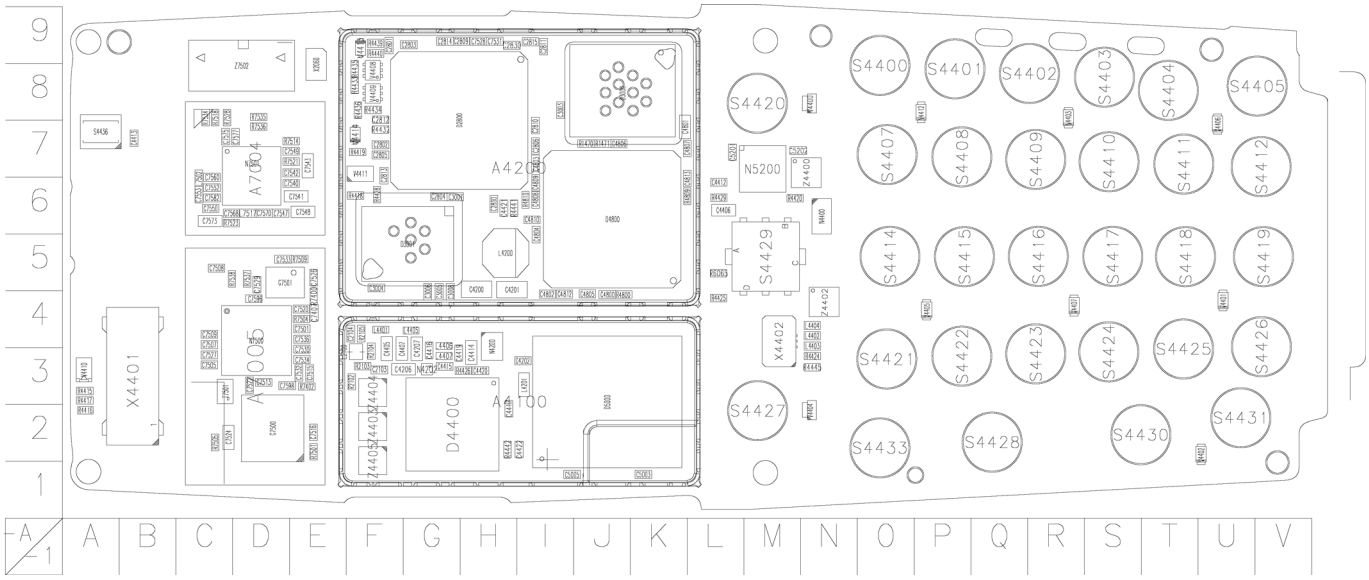

Figure 3 1em-25b

Component layouts - bottom 1em-25a and 1em-25b

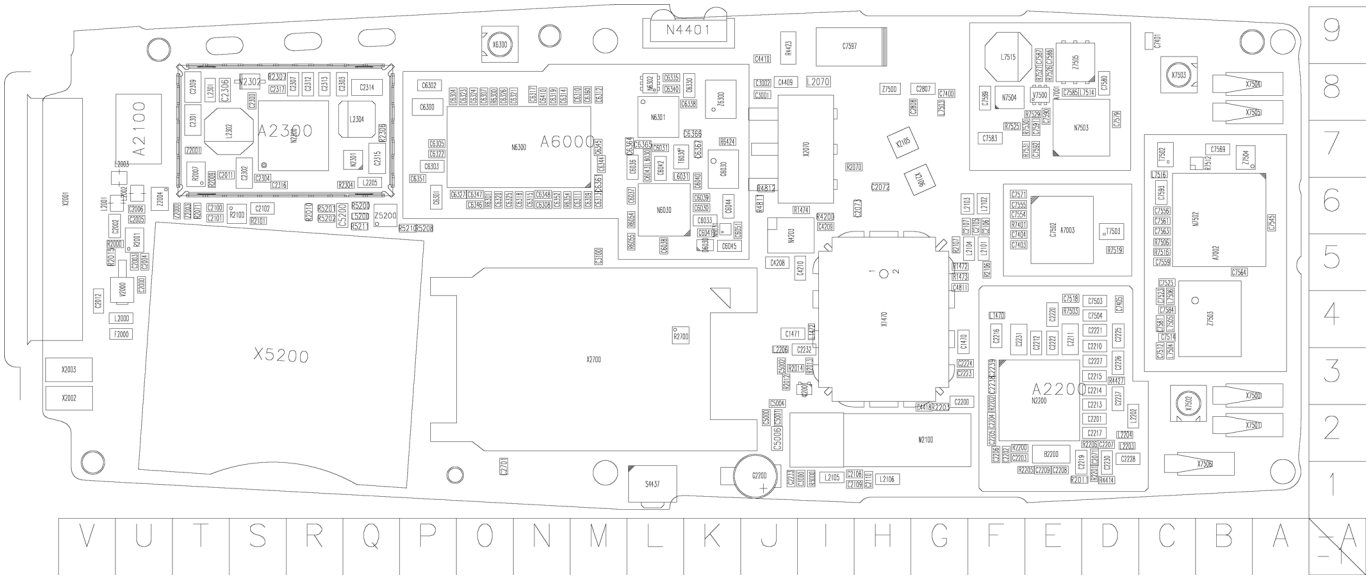

Figure 4 1em-25a

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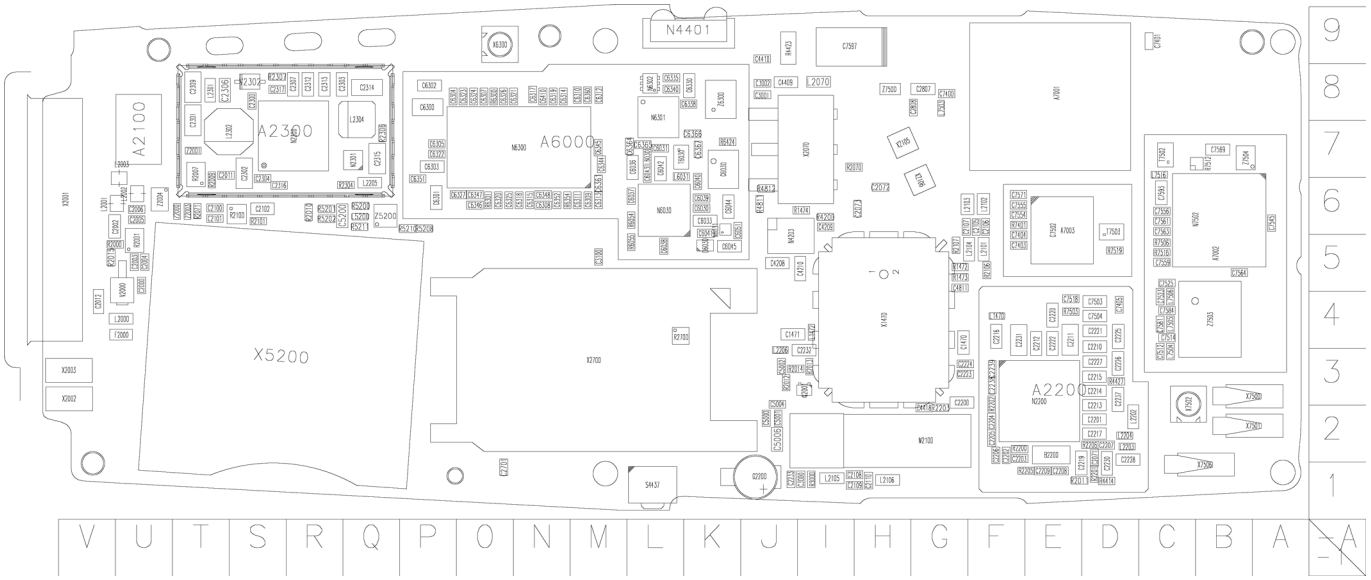

Figure 5 1em-25b

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3 — Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 USB cable

    Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

  Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.
5. Manage connection settings (depends on the tools you are using).
   - Update FPS-10 software

     Note: There is no need to activate FPS-10.
   - Activate SX-4 smart card, if you need tuning and testing functions.

     Note: When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

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Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:

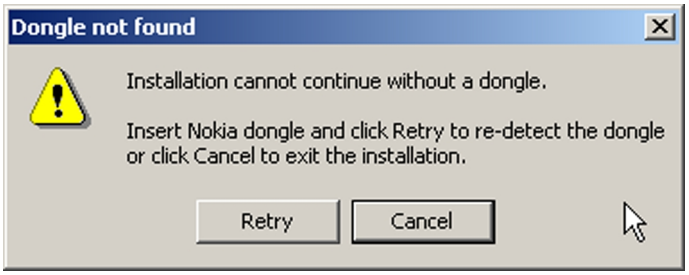

Figure 6 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

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3. Read the disclaimer text carefully and click **Yes**.

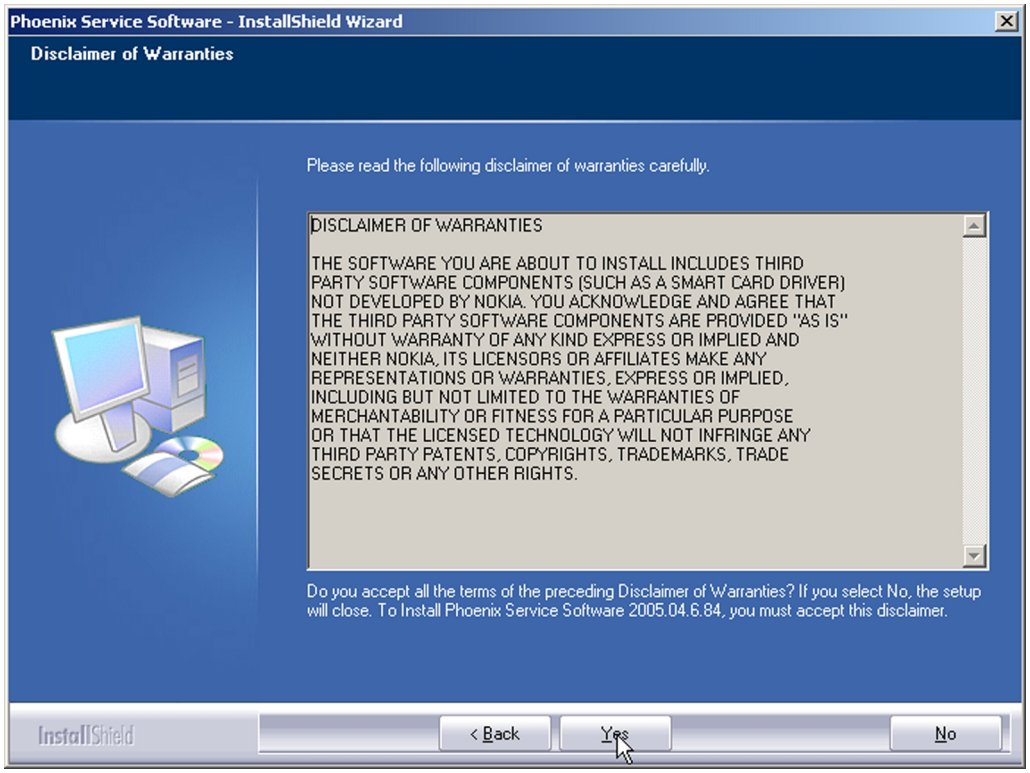

Figure 7 Disclaimer text

4. Choose the destination folder.
   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.
5. To continue, click **Next.**
   To choose another location, click **Browse** (not recommended).
6. Wait for the components to be copied.
   The progress of the installation is shown in the *Setup Status* window.
7. Wait for the drivers to be installed and updated.
   The process may take several minutes to complete.
   If the operating system does not require rebooting, the PC components are registered right away.
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.
   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.
   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

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8. To end the installation, click **Finish**.

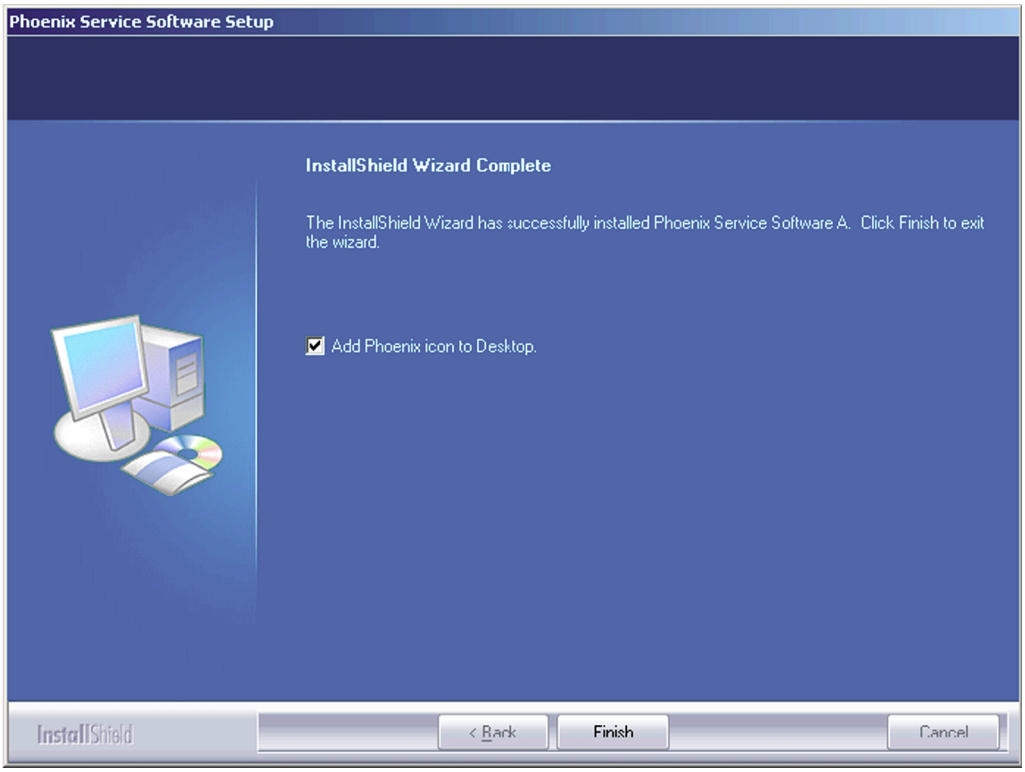

Figure 8 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.

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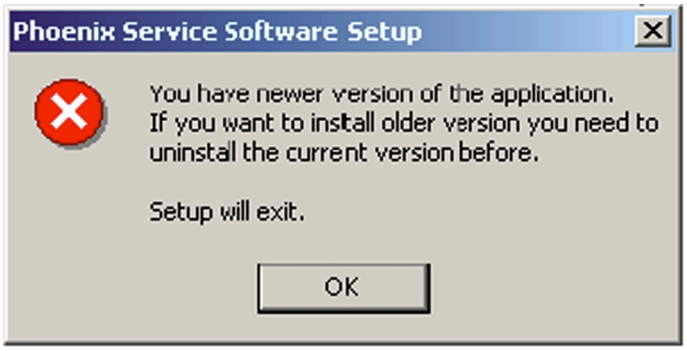

Figure 9 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

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2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .

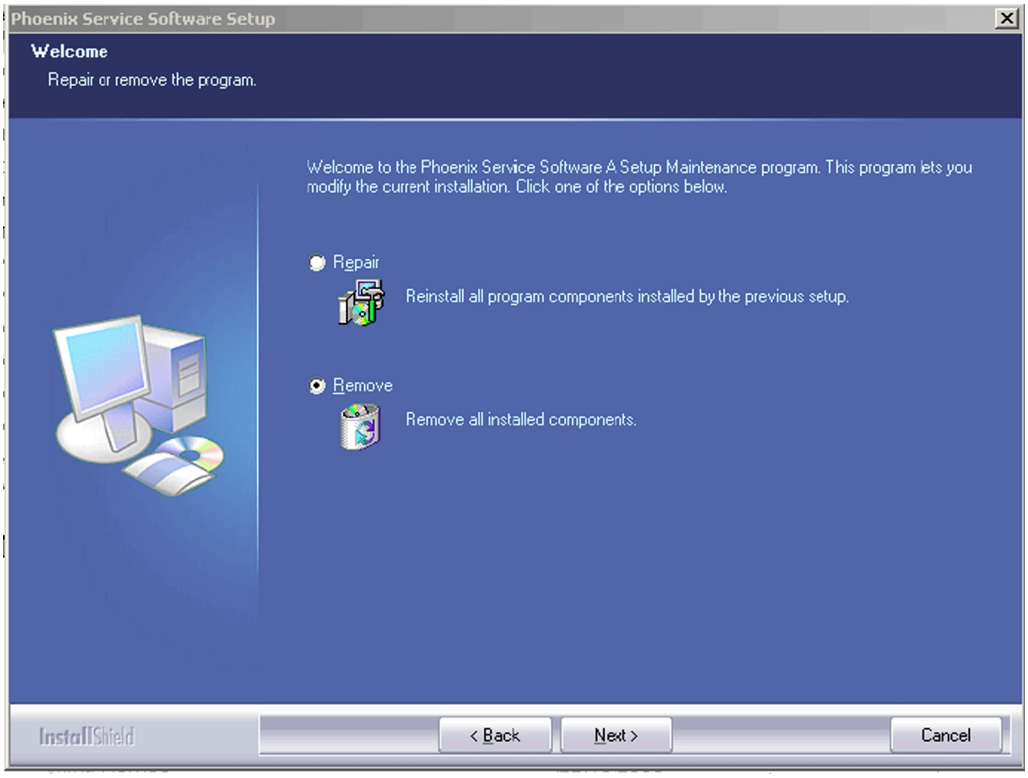

Figure 10 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.

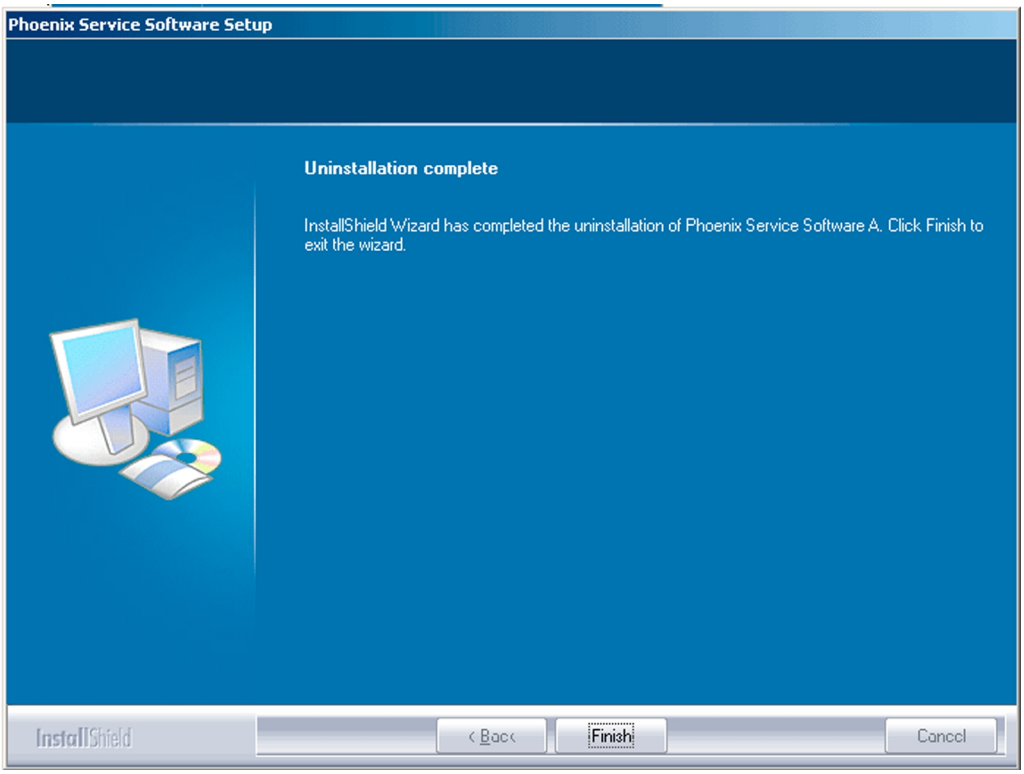

Figure 11 Finish uninstallation

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If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

Note: The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.

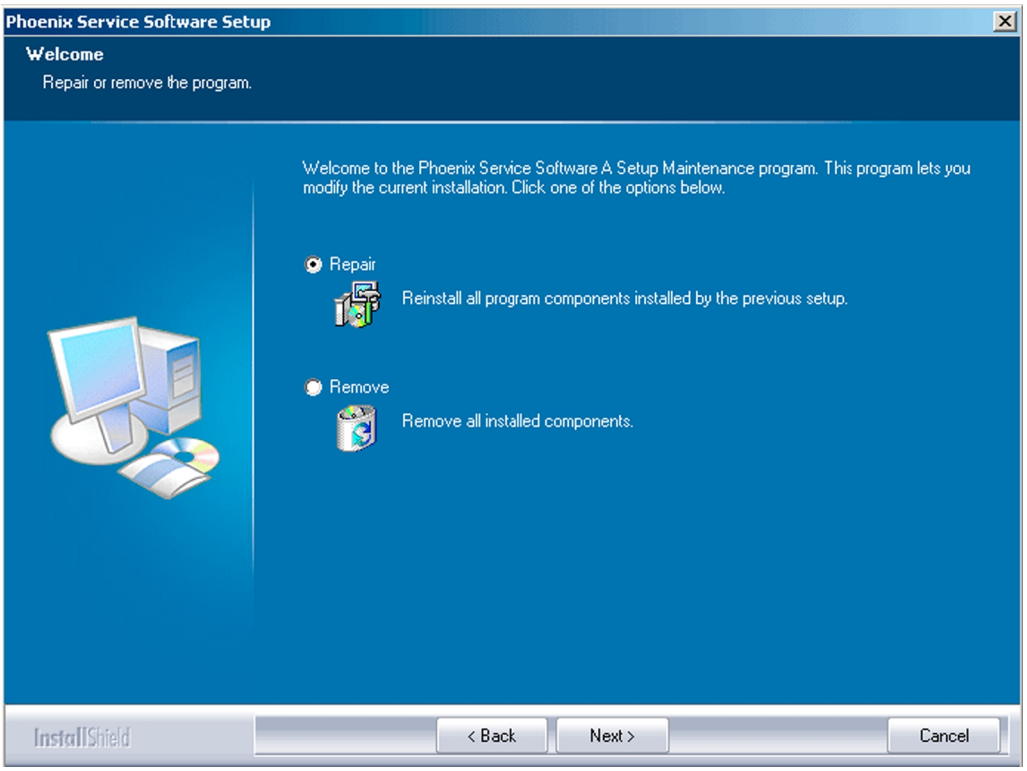

Figure 12 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Phone data package overview

Each product has its own data package (DP). The product data package contains all product-specific data files to make the Phoenix service software and tools usable with a certain phone model.

The phone data package contains the following:

- Product software binary files

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- Files for type label printing
- Validation file for the fault log repair data reporting system
- All product-specific configuration files for Phoenix software components

Data files are stored in **C:\Program Files\Nokia\Phoenix** (default).

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.
- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.

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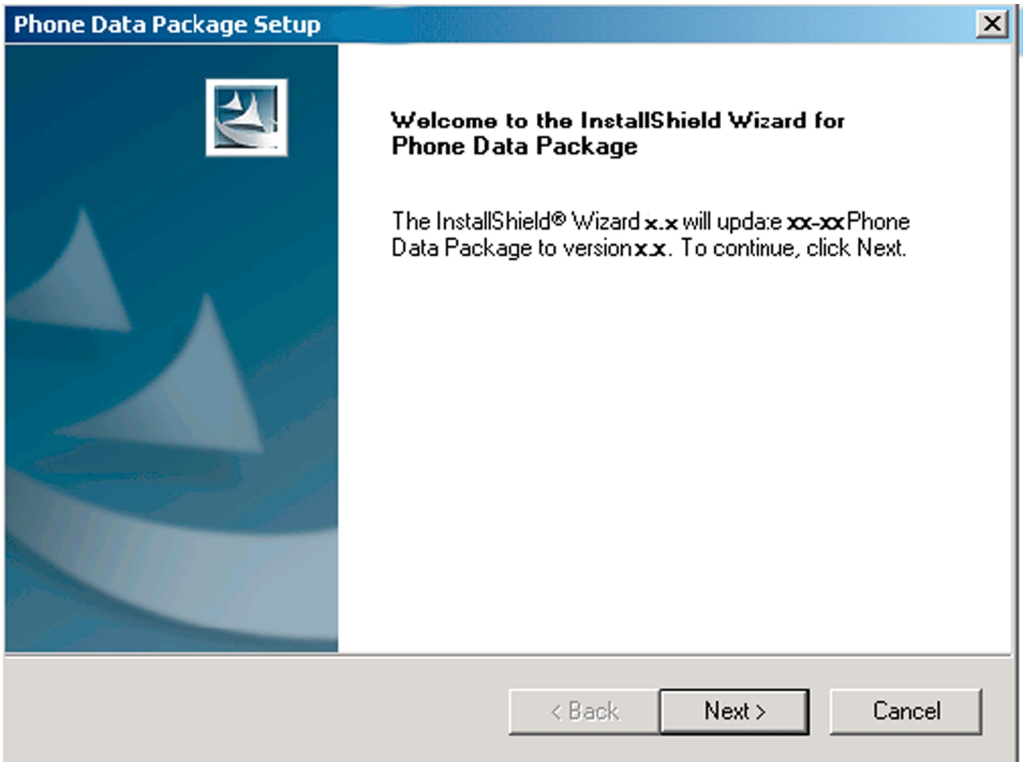
2. Click **Next**.



3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.

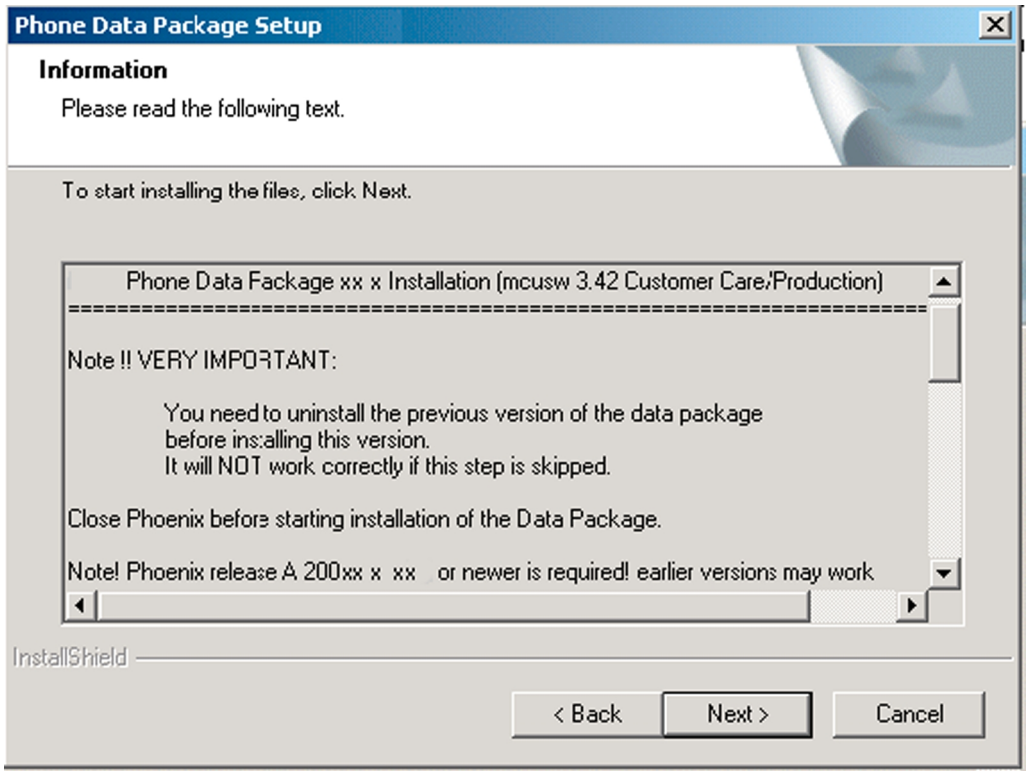


Figure 13 Data package setup information

4. To continue, click **Next**.

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5. Choose the destination folder, and click **Next** to continue.

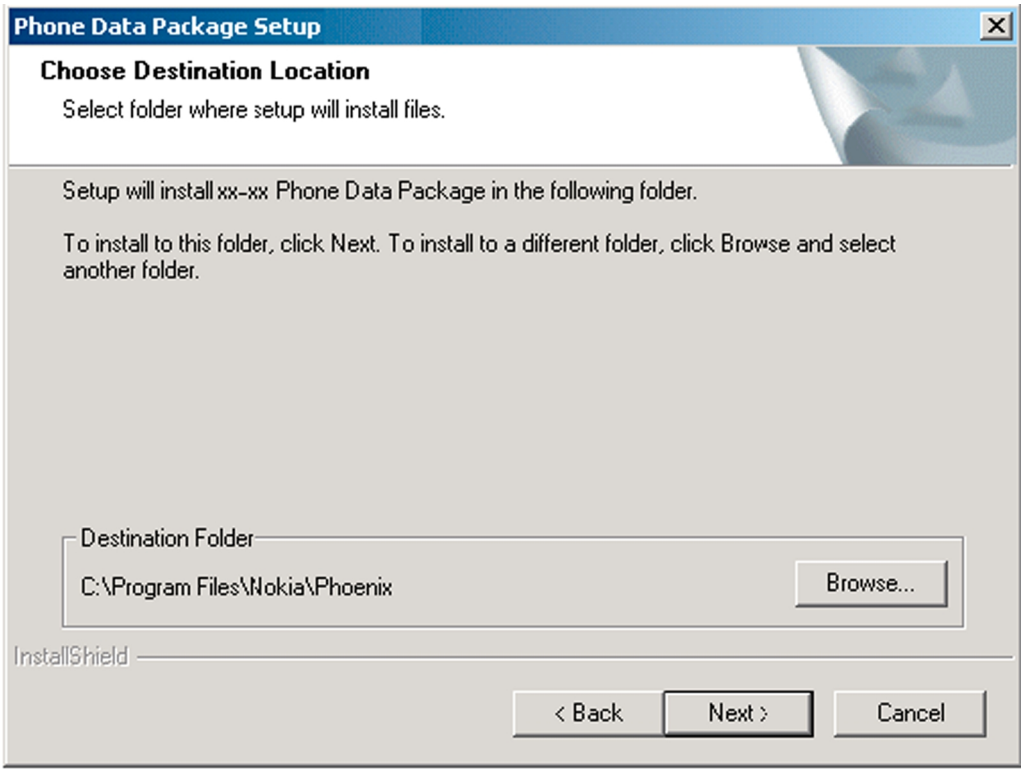
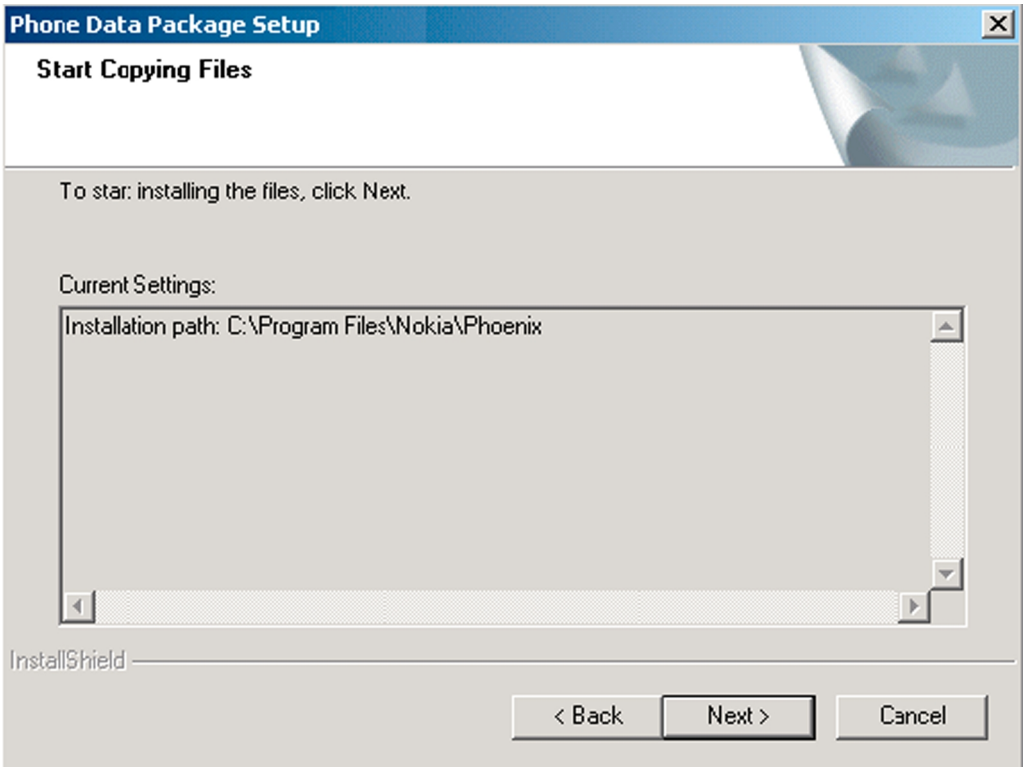


Figure 14 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



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Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.

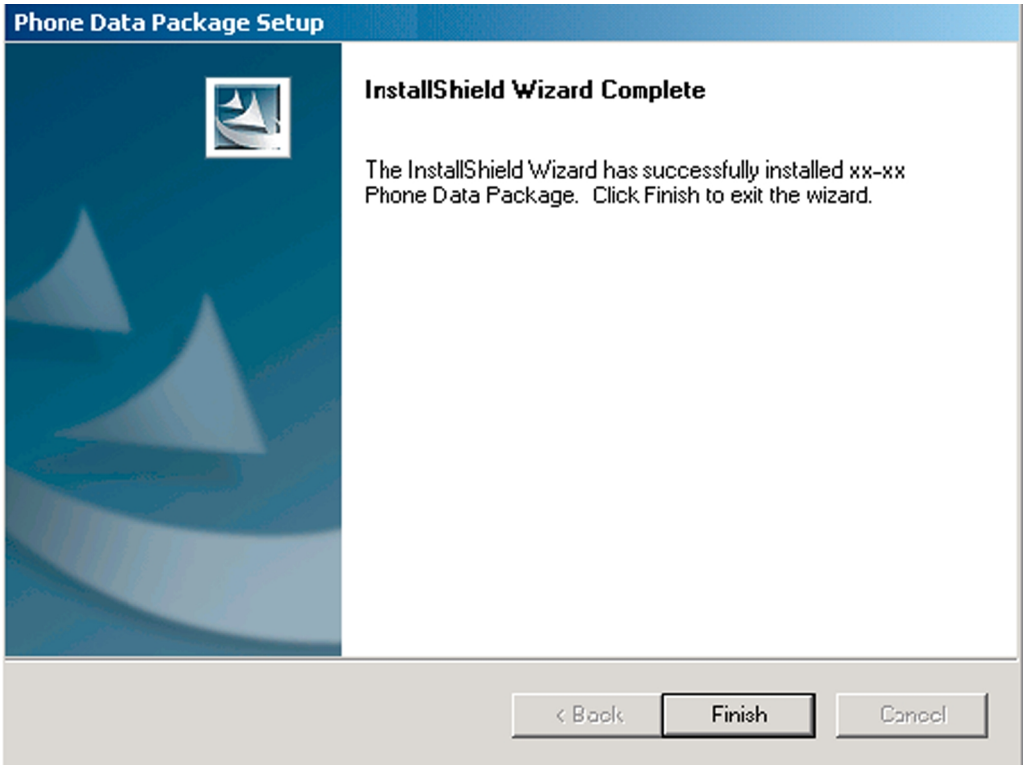

Figure 15 InstallShield Wizard Complete

Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-10 can be used after updating their flash update package files.

Uninstalling phone data package

Context

There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.

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3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.

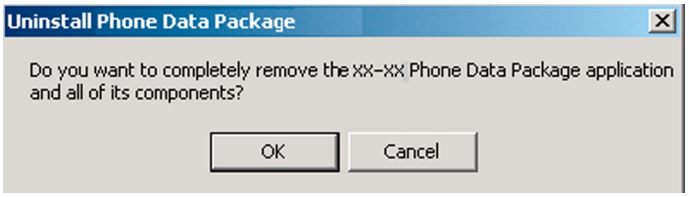

Figure 16 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.

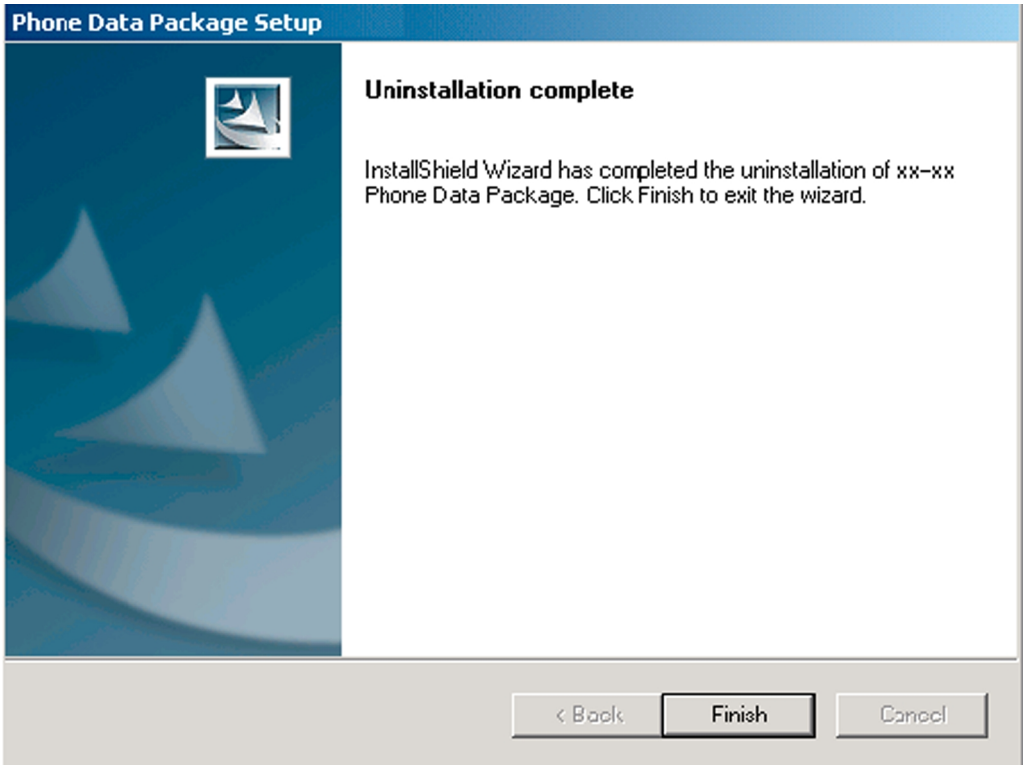

Figure 17 Finishing data package uninstallation

Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

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Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.

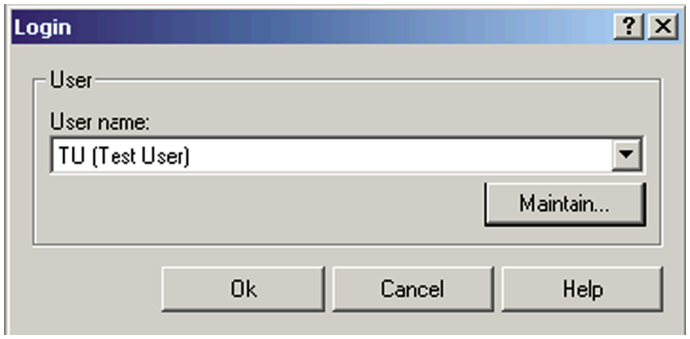

Figure 18 Phoenix login

   If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.
2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.
4. Type in the name and initials of the user, and click **OK**.
   The user is added to the user name list.
5. Select the desired user from the *User name* drop-down list, and click **OK**.

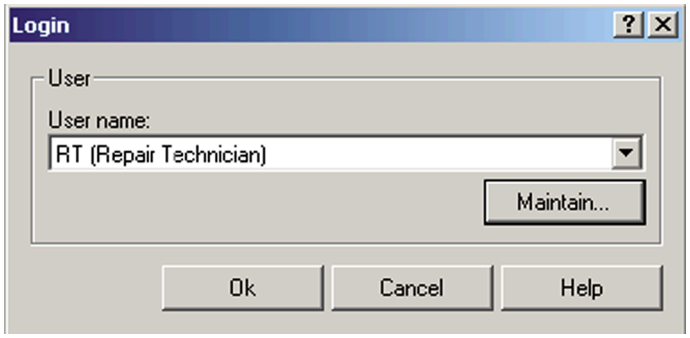

Figure 19 New user configured

Managing connections in *Phoenix*

Context

With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .

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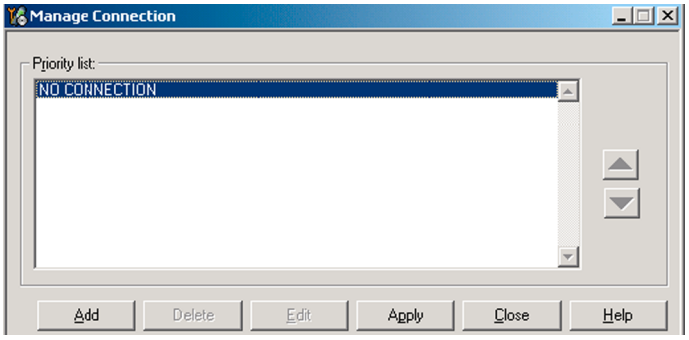
3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.

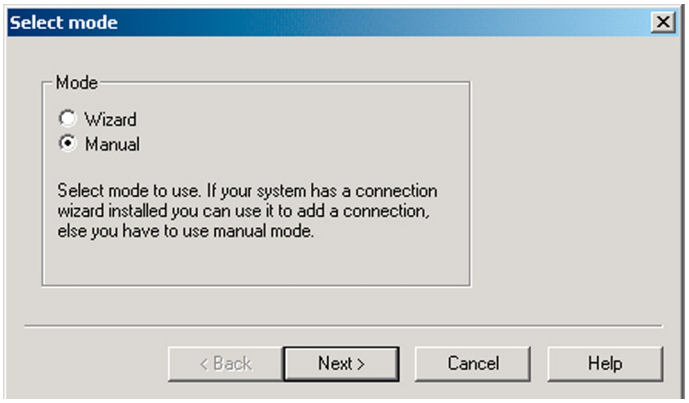


Figure 20 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:
   - Media: **FPS-10 USB**
   - DEVICE_INDEX: **0**
   - SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
   - ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:
   - Media: **FPS-10 TCP/IP**
   - NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
   - PORT_NUM: Use the default value, and click **Next**.
   - PROTOCOL_FAMILY: Use the default value, and click **Next**.
   - SOCKET TYPE: Use the default value, and click **Next**.
   - TX_BUFFER_SIZE: Use the default value, and click **Next**.
   - RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For an FPS-8 flash prommer, choose the following connection settings:
   - Media: FPS-8
   - PORT_NUM: COM Port where FPS-8 is connected
   - COMBOX_DEF_MEDIA: **FBUS**

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iv For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.

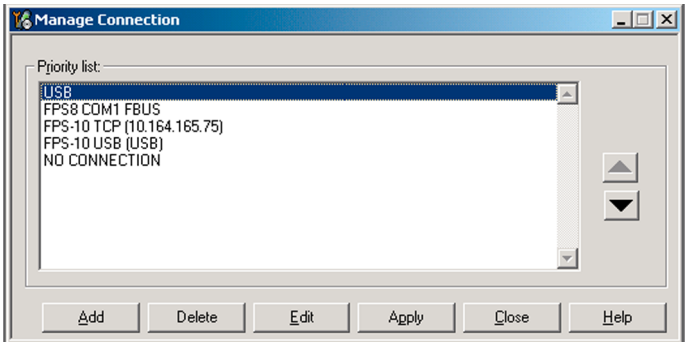

Figure 21 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

Figure 22 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:

Figure 23 Product support module information (example from RM-1)

Installing flash support files for FPS-10

Prerequisites

Note: You need to install flash support files for FPS-10 only, if you don't have the latest Phoenix available or the flash support files have changed after the latest Phoenix release.

- Flash support files are installed automatically, when you install Phoenix. Use Phoenix packages later than June 2005.
- Normally it is enough to install Phoenix and the phone-specific data package because the Phoenix installation always includes the latest flash update package files for FPS-10.
- A separate installation package for flash support files is available, and the files can be updated according to this instruction, if updates appear between new Phoenix / data package releases

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

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Steps

1. To begin installation, double- click *flash_update_x_yy.exe* .

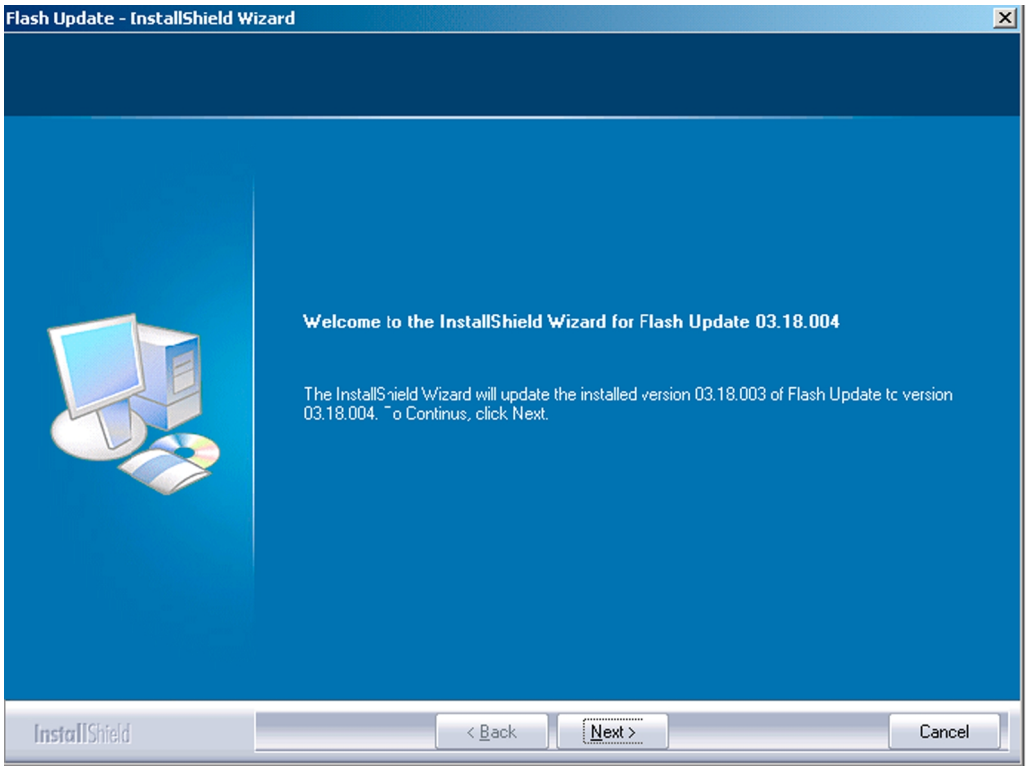

Figure 24 Flash update welcome dialog

If the same version of Flash Update package already exists, and you want to reinstall it, the previous package is first uninstalled. Restart installation again after that.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If you really want to downgrade, uninstall newer files manually from **Control Panel** and then rerun the installation again.

Figure 25 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

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3. It is highly recommended to install the files to the default destination folder *C:|Program Files|Nokia |Phoenix*. Click **Next** to continue.

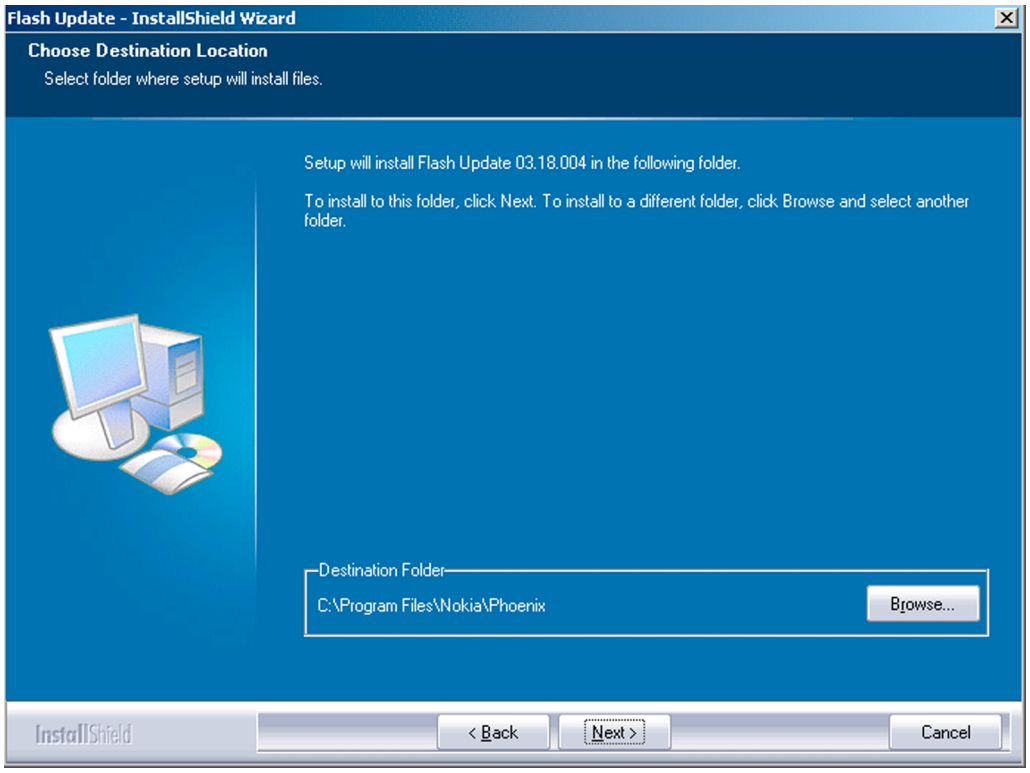

Figure 26 Flash destination folder

When installing the flash update files for the first time you may choose another location by selecting **Browse**. However, this is not recommended.

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4. To complete the installation procedure, click **Finish** .

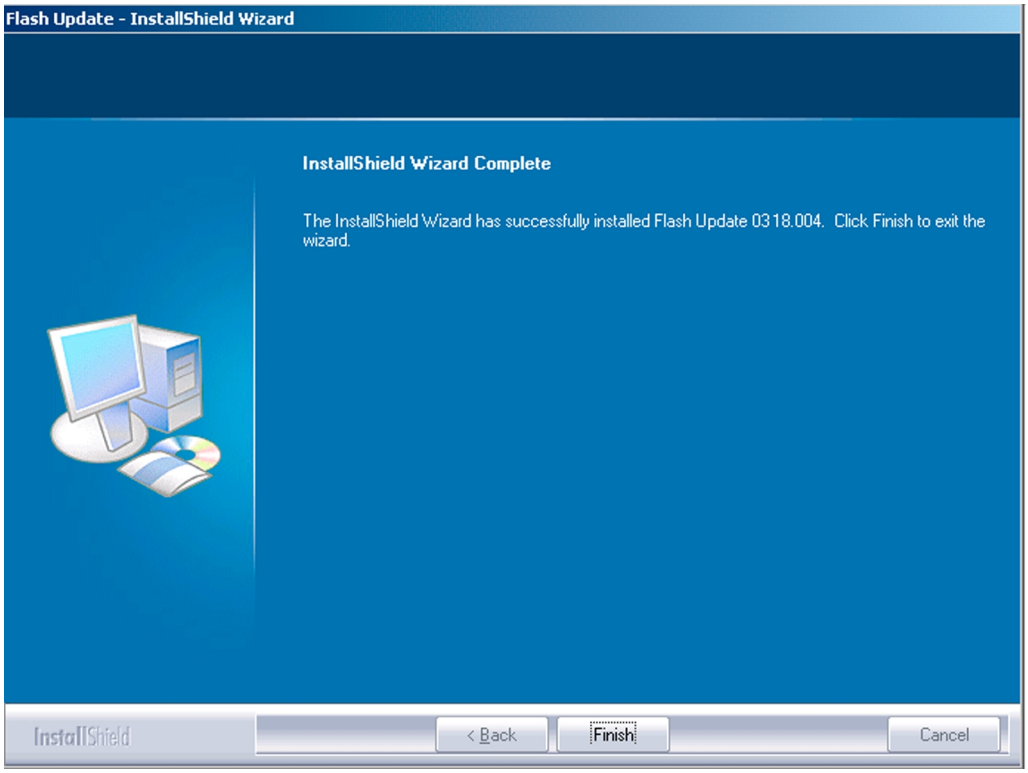

Figure 27 Finish flash update

Next actions

FPS-10 flash prommers must be updated using Phoenix!

Updating FPS-10 flash prommer software

Steps

1. Start *Phoenix Service Software* and log in, manage connection correctly for your flash prommer.
2. Choose **Flashing→Prommer maintenance** .
3. When the new flash update package is installed to the computer you will be asked to update the files to your Prommer. To update the files, click **Yes**. Click **OK** if the computer informs you about an unsafe removal of the device.
4. Alternatively you can update the FPS-10 flash prommer software by clicking the **Update** button.

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5. Wait until you are notified that update has been successful; the procedure will take a couple of minutes. Click **OK** to close the *Update Done* window.

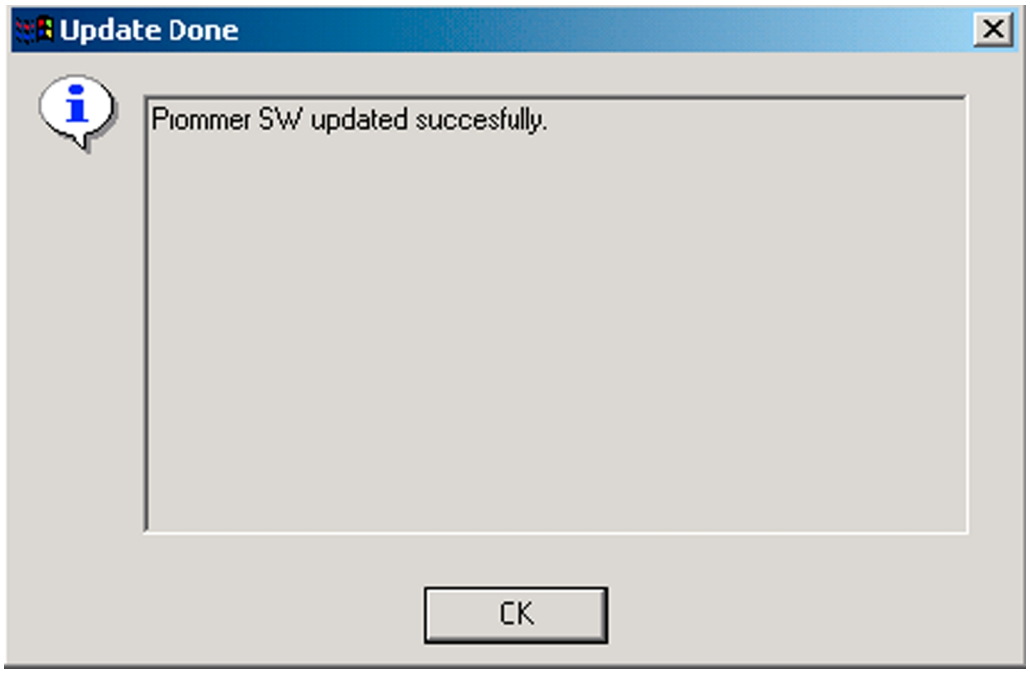

Figure 28 Prommer SW update finished

6. If you are using the FPS-10 flash prommer, check that it is detected from the progress info. Check also the status leds in the FPS-10. The MODE2 led (green), VBAT and POWER leds (red) should be lit. If you are using LAN connection, the LAN led (yellow) should be blinking.
7. Check that your FPS-10 flash prommer has enough memory. Flashing the SU-18 with FPS-10 needs at least 128 MB of SRAM memory in the prommer.

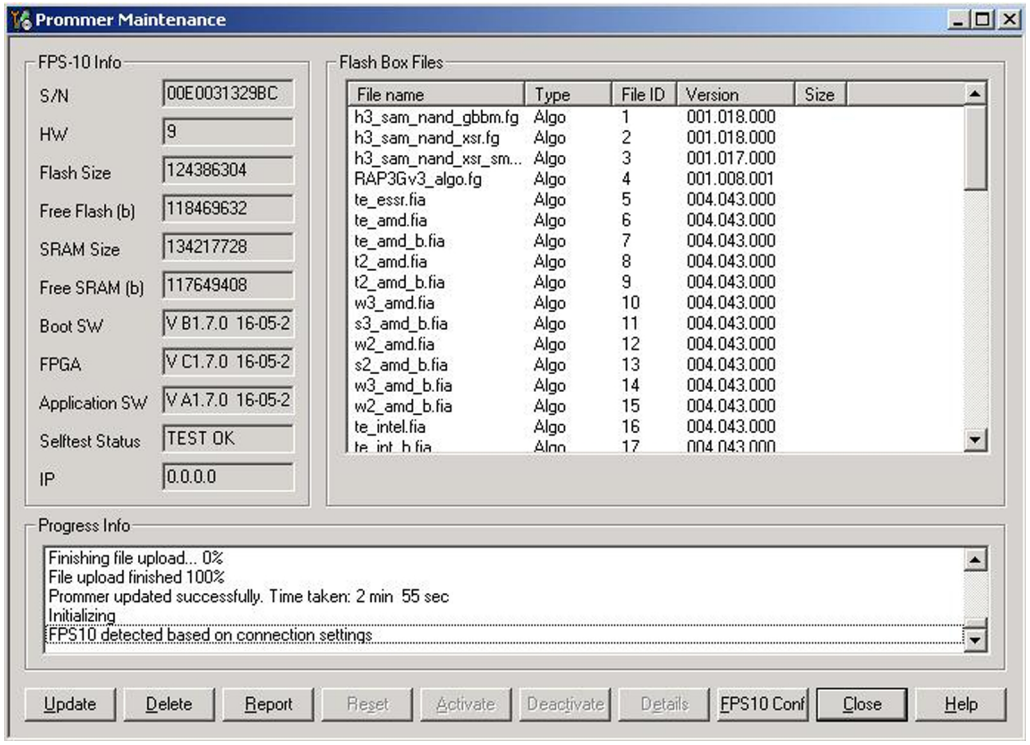

Figure 29 Prommer maintenance window

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Alternative steps

- You can update FPS-10 SW by clicking the **Update** button and selecting the appropriate fpsxupd.ini file in *C:|Program Files|Nokia|Phoenix|Flash*.

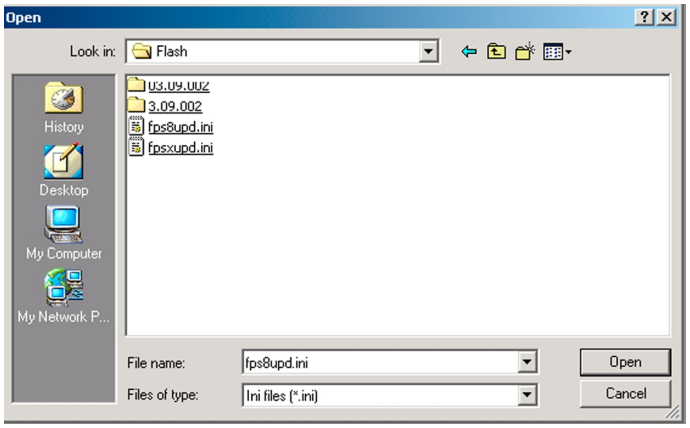

Figure 30 Flash directory window

- All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash box files* window and select the file type to be loaded.

  More information can be found in Phoenix **Help**.

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4 — Service Tools and Service Concepts

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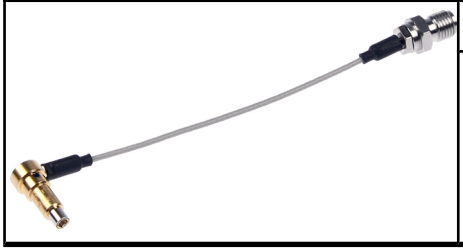
Service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-10;RM-24, refer to various concepts.

	CA-31D	USB cable	
	The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		
	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		
	CA-87RS	RF service cable	
	RF service cable connecting to the module jig.		

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CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

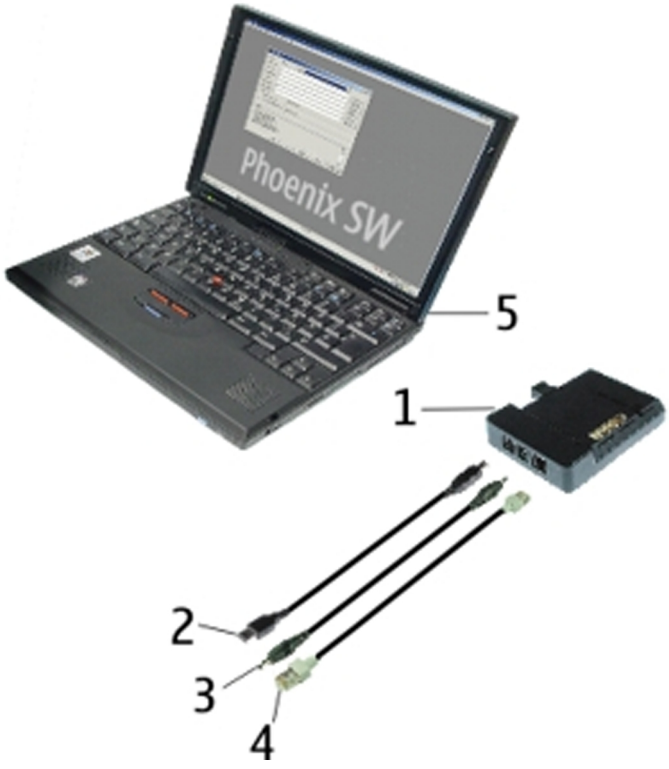
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.



Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

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FLS-5	Flash device	
FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.		

FPS-10	Flash prommer	

FPS-10 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-10 flash prommer features:

- Flash functionality for BB5 and DCT-4 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable

FS-2	Flash adapter	

FS-2 has the following features:

- Provides galvanic connection to terminal test pads
- Provides standardized interface towards Control Unit
- Provides RF connection using galvanic connector or coupler
  Multiplexing between USB and FBUS media, controlled by Vusb

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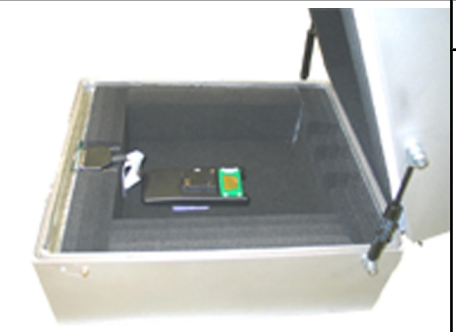
JBT-9	Bluetooth test and interface box (sales package)	

The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .

Sales package includes:

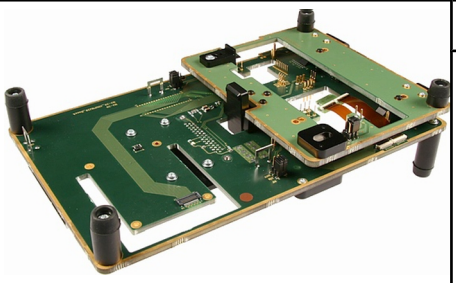
- JBT-9 test box
- Installation and warranty information



JXS-1	RF shield box	

Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal.

The shield box is not an active device, it contains only passive filtering components for RF attenuation.



MJ-39	Module jig	

MJ-39 is meant for component level troubleshooting.

The jig includes an RF interface for GSM, WCDMA and WLAN. In addition, it has the following features:

- Provides mechanical interface with the engine module
- Provides galvanic connection to all needed test pads in module
- Multiplexing between USB and FBUS media, controlled by Vusb
- UI test interface
- Mini USD interface
- Duplicated SIM connector
- Audio components: IHF, MIC, earpiece
- Connector for control unit
- Access for Pop-Port™ system connector

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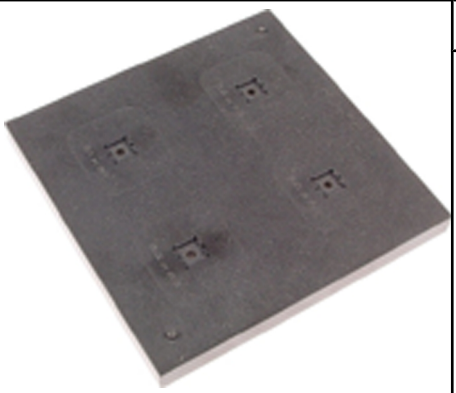
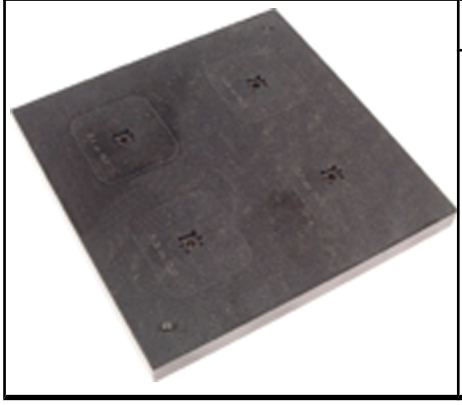
	PCS-1	Power cable	
	The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.		
	PKD-1	SW security device	
	SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.		
	RJ-56	Rework jig	
	RJ-56 is a rework jig used with ST-21.		
	RJ-57	Rework jig	
	RJ-57 is a rework jig used with ST-22.		

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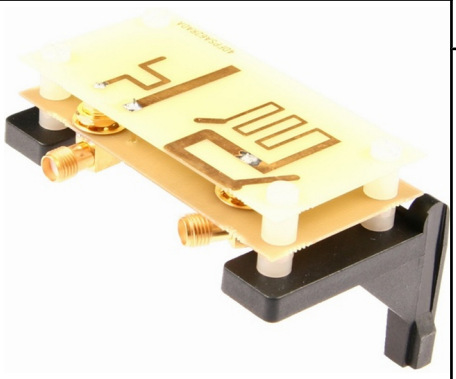
RJ-82	Soldering jig	

RJ-82 is a soldering jig used for soldering and as a rework jig for the engine module.



SA-80	RF coupler for RM-24	

SA-80 is an RF coupler for GSM RF testing. It is used together with the product specific flash adapter FS-2 and flash adapter base SS-62.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-80:

1

Table 2 RM-24/US

System	Channel	Tx-att. (dB)	Rx-att. (dB)
GSM 850	128	8.3	9
	190	7.8	9
	251	8.3	9
GSM 1800	512	12.8	8
	698	11.8	8
	885	9.5	8
GSM 1900	512	8.1	8
	700	8.4	10
	810	8.5	11

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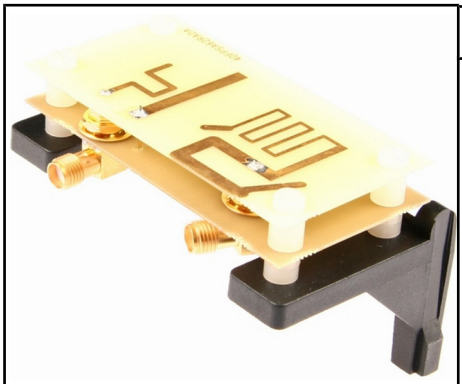

SA-98	RF coupler for RM-10	

SA-98 is an RF coupler for GSM and WCDMA testing..

1

Table 3 RM-10/3G

System	Channel	Tx-att. (dB)	Rx-att. (dB)
EGSM 900	975	5.2	7
	38	4.8	9
	124	4.7	10
GSM 1800	512	7.9	6
	698	7.3	6
	885	6	6
GSM 1900	512	6.3	7
	700	6.3	8
	810	6.3	10

2

Table 4 RM-10/3G

System	Channel	Tx-att. (dB)	Rx-att. (dB)
	TX / RX		
WCDMA	9612 / 10562	10	8
	9750 / 10700	7.4	8
	9888 / 10838	9.4	10

SB-7	WLAN test box	

WLAN test requires defined position for the device.

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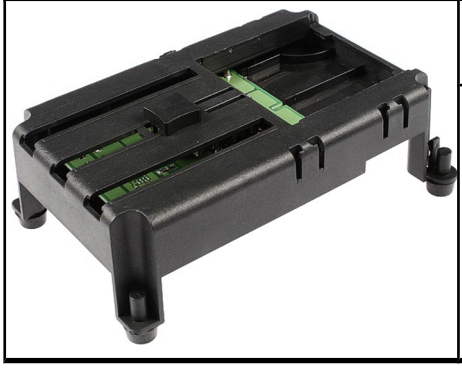
	SPS-1	Soldering Paste Spreader	
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers and B-to-B connectors.		
	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		
	SS-62	Generic flash adapter base for BB5	
	• generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB		

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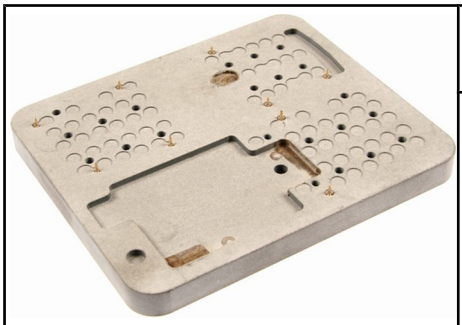
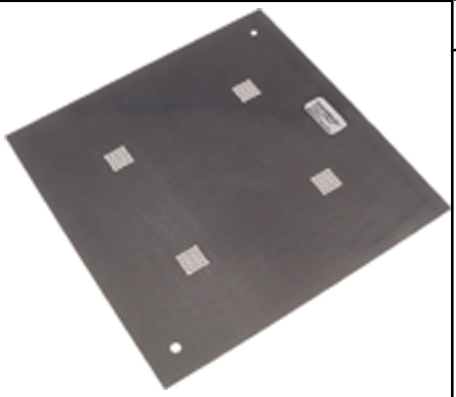
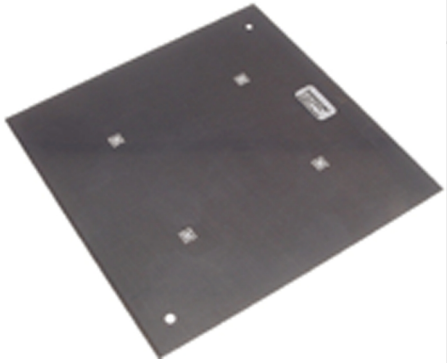
	SS-70	Domesheet assembly jig	
	ST-21	Rework stencil	
	ST-21 is a rework stencil used with rework jig RJ-56.		
	ST-22	Rework stencil	
	ST-22 is a rework stencil used with rework jig RJ-57.		
	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

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	XCS-4	Modular cable	
	XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.		
	XRS-6	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector approximately 610 mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		

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Service concepts

E70_SS-46_FS-2_FPS-10

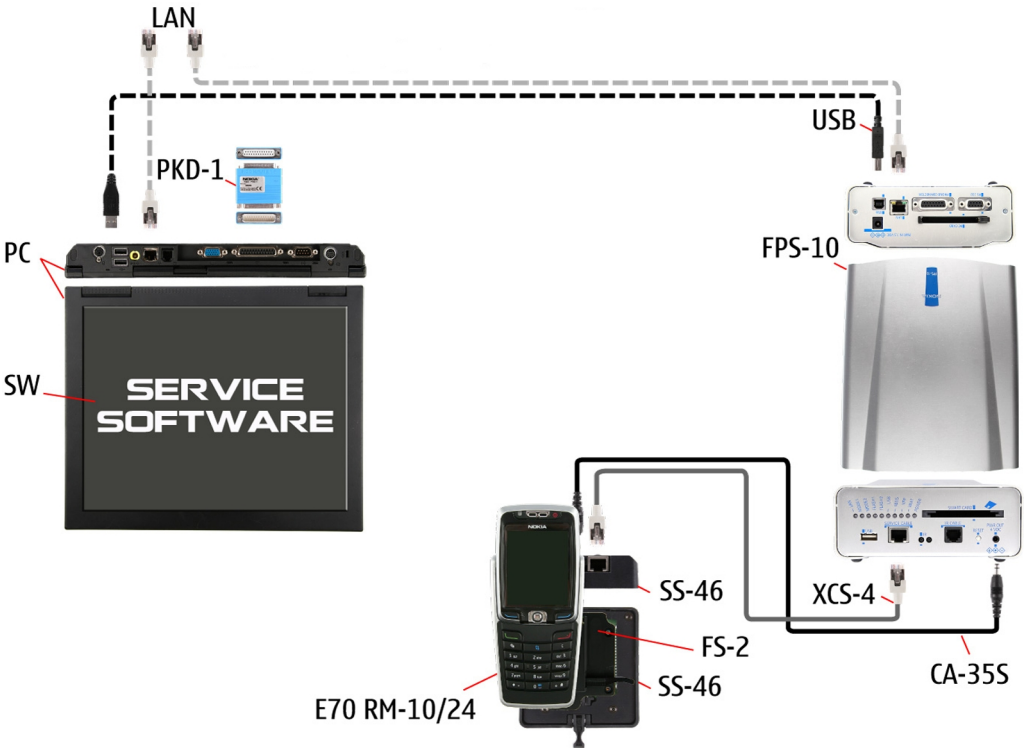

Figure 31 SS-46_FS-2_FPS-10

Note: FPS-8 concept can also be used for flashing.

Description	Type
FS-2	Flash adapter
SS-46	Interface adapter
XMS-3	Modular cable
	Standard USB cable
FPS-10	Flash prommer box
	Standard USB cable
PKD-1	SW security device

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E70_MJ-39_FPS-10_RF

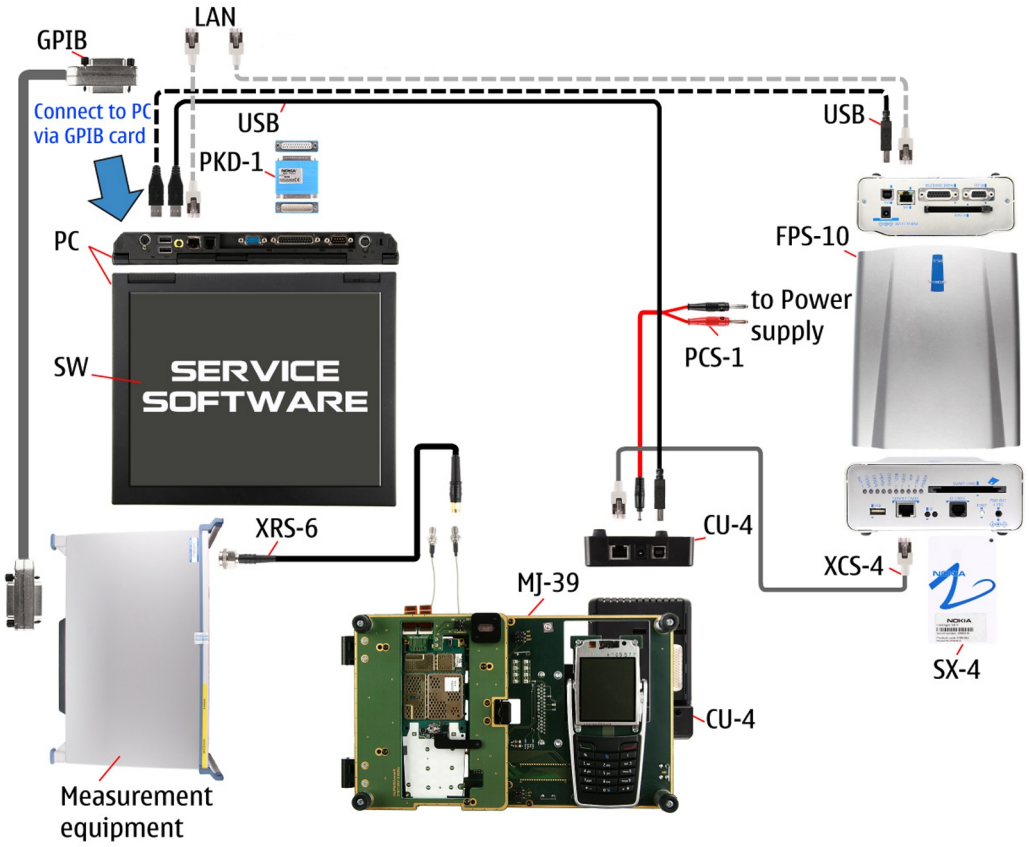

Figure 32 MJ-39_FPS-10_RF

Type	Description
MJ-39	Module jig
CU-4	Control unit
FPS-10	Flash prommer box
SX-4	Smart card
PCS-1	DC power cable
	Standard USB cable
	Standard USB cable
	GPIB control cable
XRS-6	RF cable
PKD-1	SW security device
	RF shield box

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E70_POS_service concepts

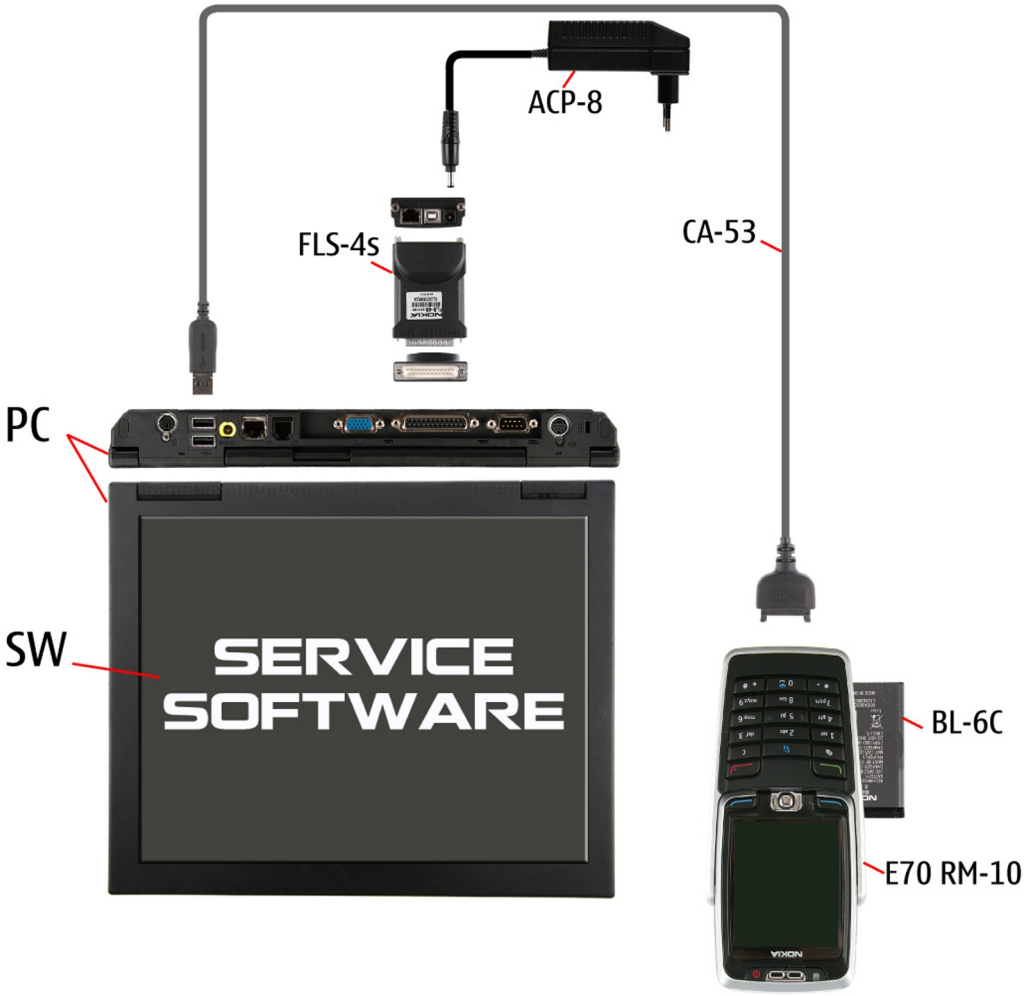

Figure 33 POS_service concepts

Type	Description
CA-53	USB connectivity cable
FLS-4s	POS flash device

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E70_MJ-39_cardreader_RF

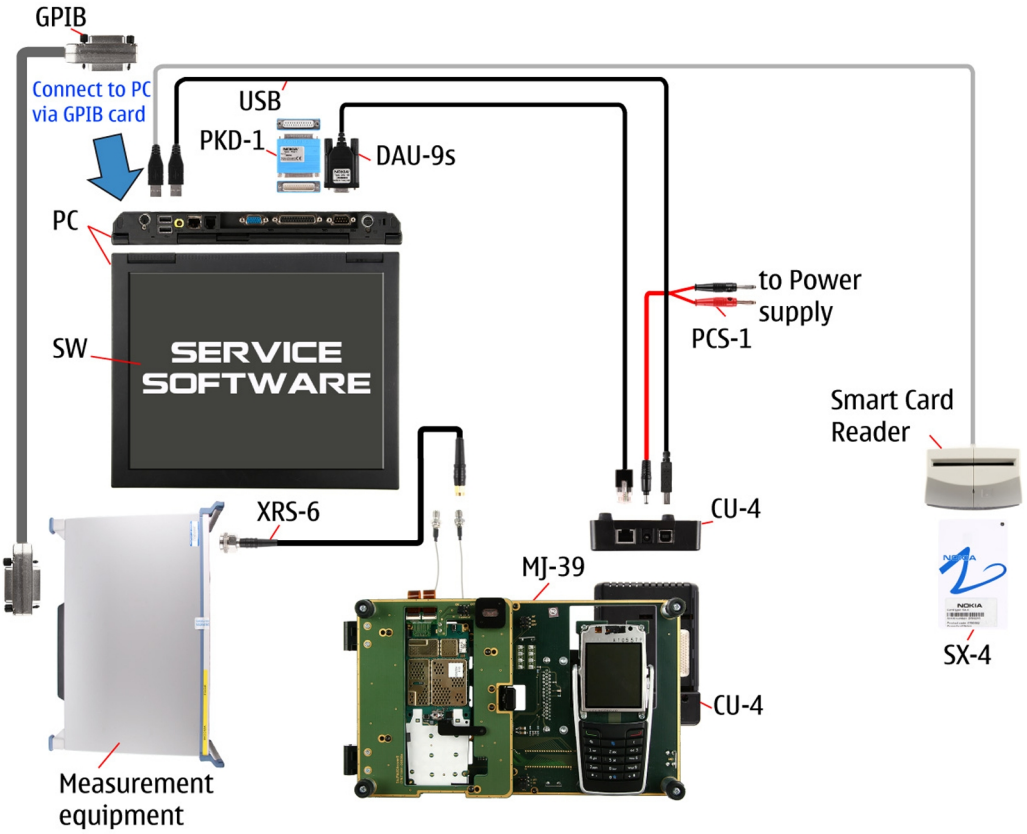

Figure 34 MJ-39_cardreader_RF

Description	Type
MJ-39	Module jig
CU-4	Control unit
	Standard USB cable
PCS-1	DC power cable
	Standard USB cable + smart card reader
SX-4	Smart card
XRS-6	RF cable
	GPIB control cable
PKD-1	SW security device
	RF shield box

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E70_SS-62_FS-2_FPS-10

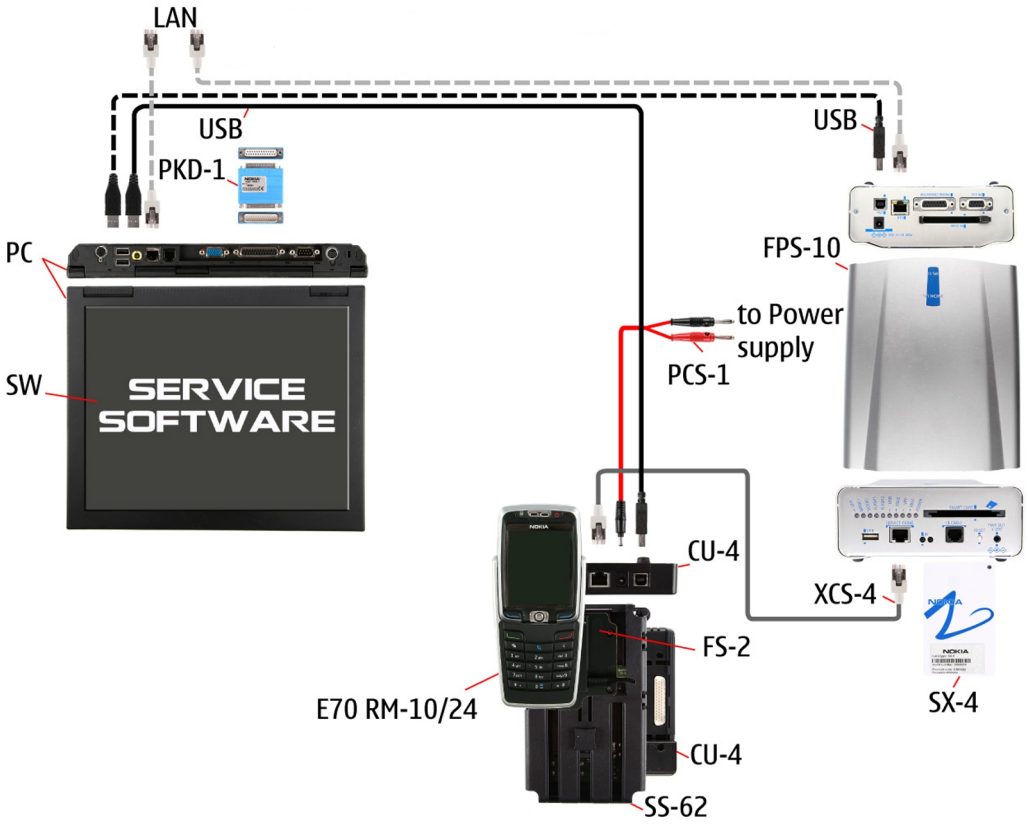

Figure 35 SS-62_FS-2_FPS-10

Note: FPS-8 concept can also be used for flashing.

Description	Type
SS-62/FS-2	Flash adapter
CU-4	Control unit
XMS-3	Modular cable
PCS-1	Power cable
FPS-10	Flash prommer box
	Standard USB cable
	Standard USB cable
PKD-1	SW security device

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E70_SS-62_FPS-10_RF_EU

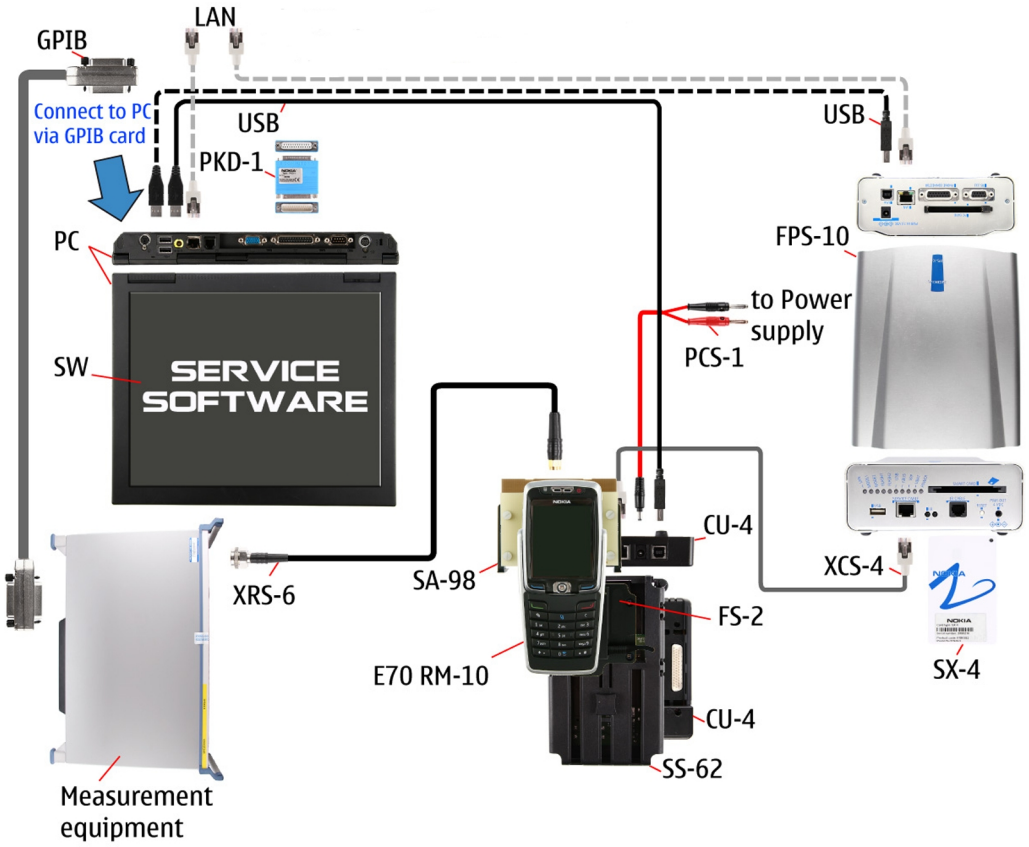

Figure 36 SS-62_FPS-10_RF_EU

Type	Description
SS-62/FS-2	Flash adapter
CU-4	Control unit
SA-80/SA-98	RF coupler
PCS-1	Power cable
	Standard USB cable
	Standard USB cable + smart card reader
SX-4	Smart card
	GPIB control cable
XRS-6	RF cable
PKD-1	SW security device
	RF shield box

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E70_SS-62_FS-2_FPS-10_RF_US

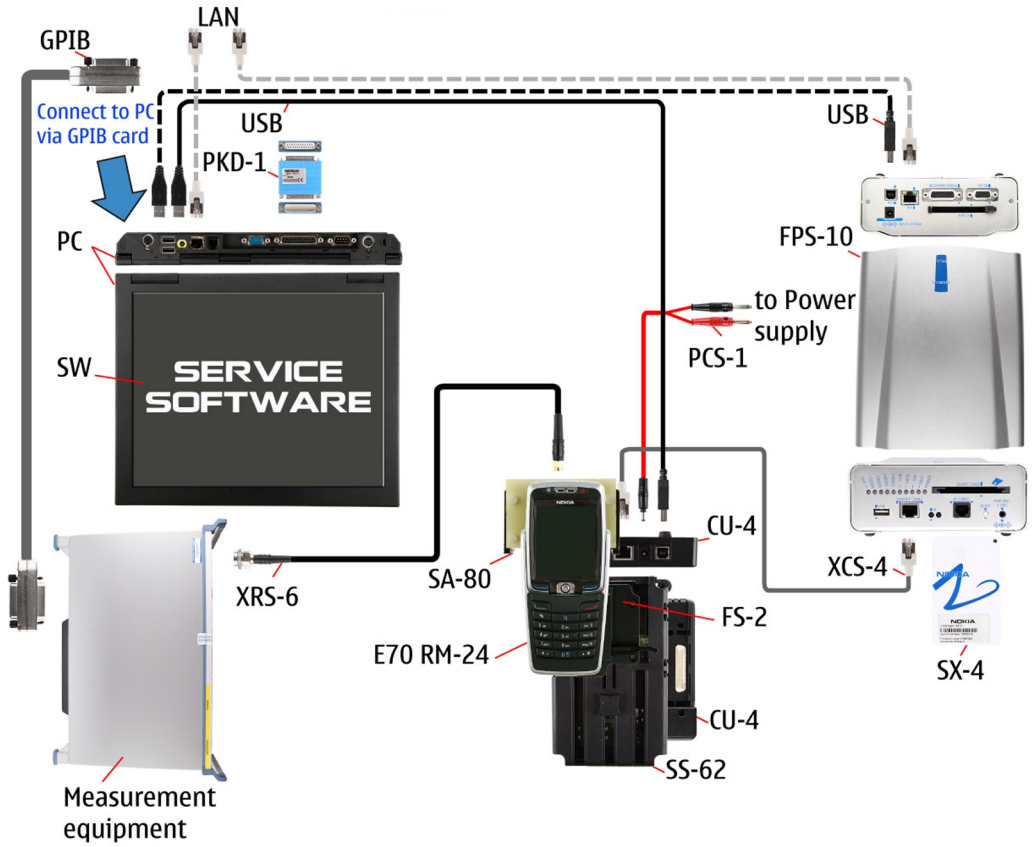

Figure 37 SS-62_FS-2_FPS-10_RF_US

Type	Description
SS-62/FS-2	Flash adapter
CU-4	Control unit
SA-80/SA-98	RF coupler
PCS-1	Power cable
	Standard USB cable
	Standard USB cable + smart card reader
SX-4	Smart card
	GPIB control cable
XRS-6	RF cable
PKD-1	SW security device
	RF shield box

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5 — Disassembly/Reassembly Instructions

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Disassembly / reassembly instructions

Prerequisites

Figure 38 Needed tools.

Note: Reassembly takes place in the reverse order.

Note the reassembly-specific instructions in steps **4.**, **12.**, **30.**, **34.** and **44.**

Steps

1. Protect the window with a film.

2. Unlock and remove the BATTERY COVER.

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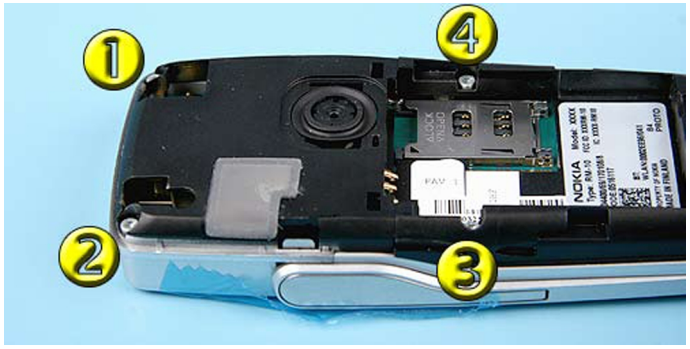
3. Remove the ANTENNA MODULE, beginning from the battery compartment.

4. Unscrew the four Torx Plus® size 6 SCREWS in the order shown.



Note: For assembly, use a reverse order and Torque driver with a torque setting of 20Ncm.

5. Open the FLIP MODULE.

6. Lift a bit the A-COVER.

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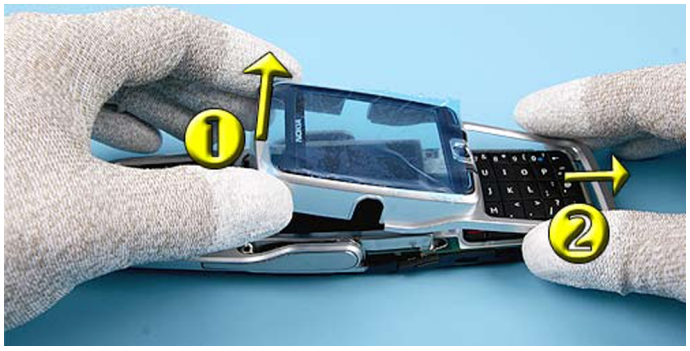
7. Remove the A-COVER ASSY in the shown order.



8. Cover the LCD MODULE with a protective film.

9. Remove the ENGINE QWERTY KEYMAT.

10. Remove the POWER KEY.

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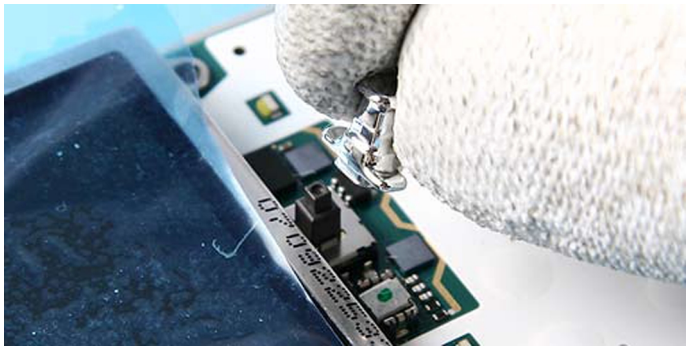
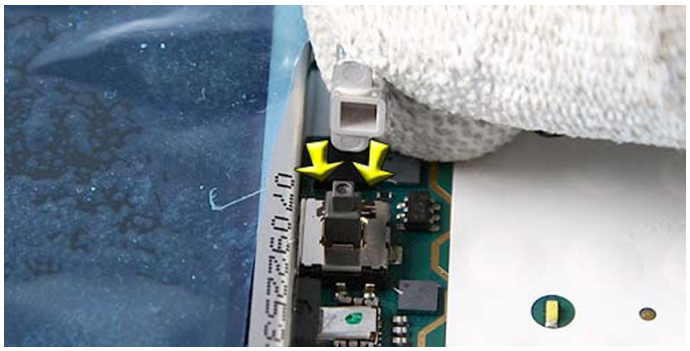
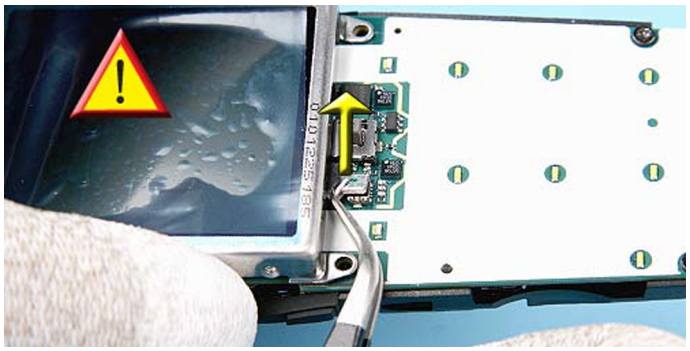
11. Remove the JOYSTICK HAT.



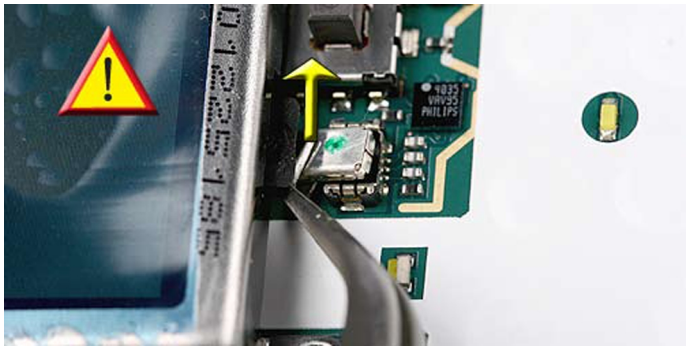
12. **For assembly only!** Note the correct position when reassembling the JOYSTICK.



13. The FLIP HINGE is connected with the COAX CABLE to the ENGINE MODULE.



14. Very gently, open the COAX CONNECTOR by using angled tweezers.



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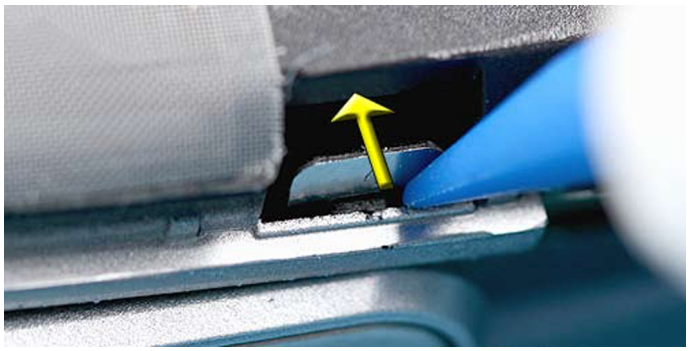
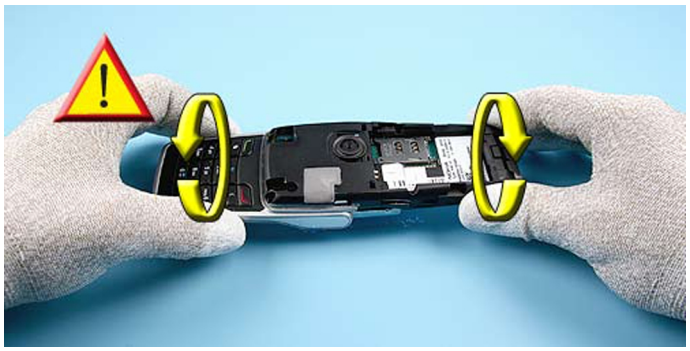
15. The FLIP MODULE is attached to the B-COVER with two snaps.

16. Place the SS-93 between the B-COVER edge and the clip of the FLIP MODULE and release it carefully.



17. Carefully, turn over the unit securing the FLIP MODULE. Do not yet separate the parts from each other.



18. Unlock another clip of the FLIP MODULE carefully.

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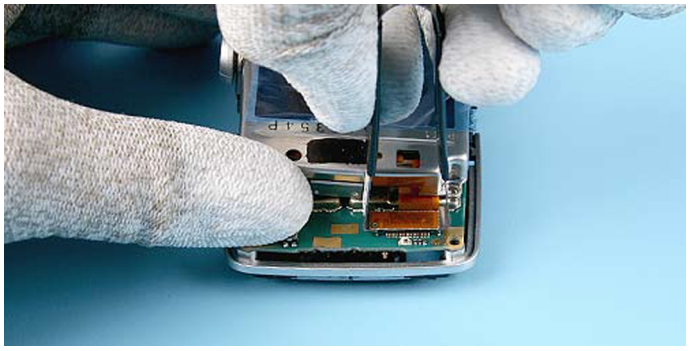
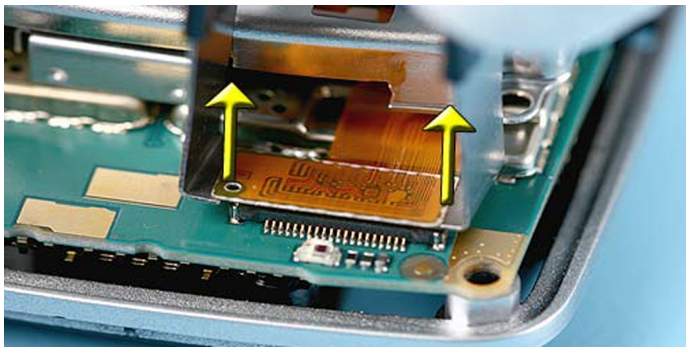
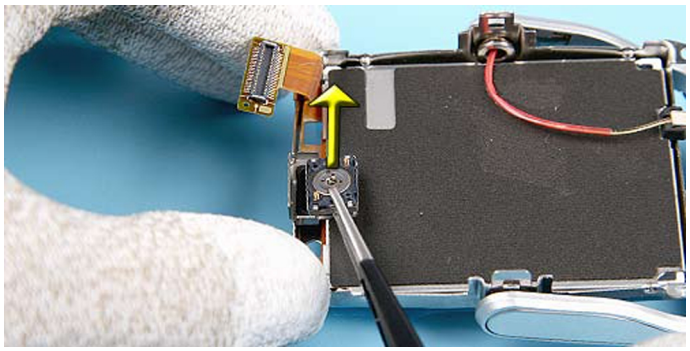
19. Lift the FLIP MODULE a bit and place the flex connector opening tool as shown.



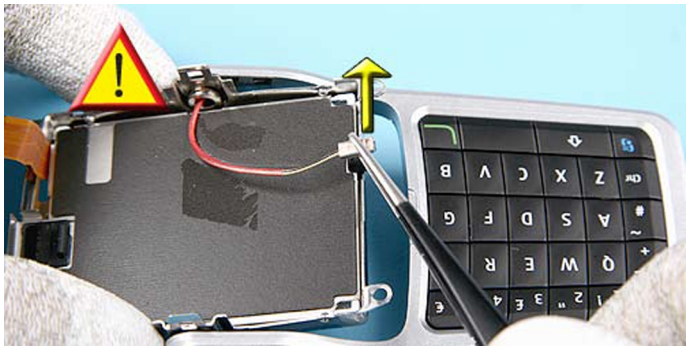
20. Gently open the flex connector.



21. Remove the EARPIECE.



22. Lift the COAX CABLE connector a bit from its holder with tweezers.



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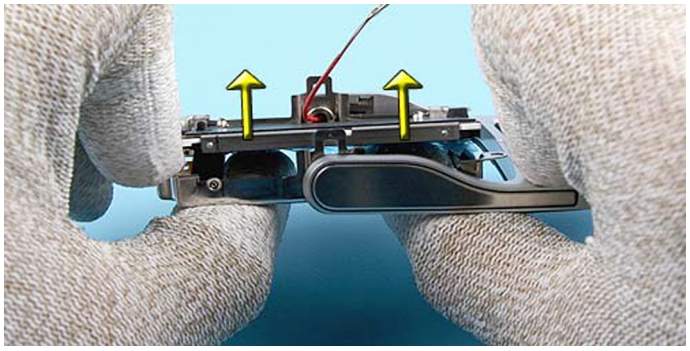
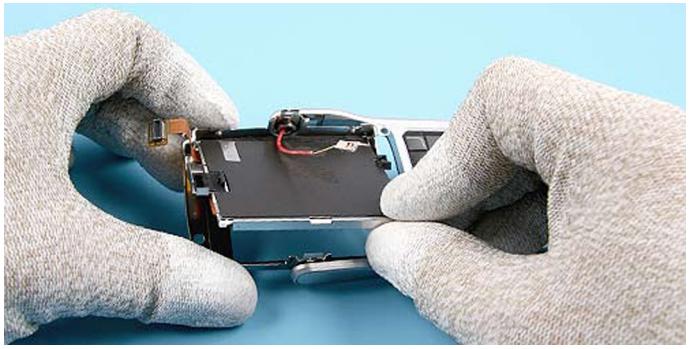
23. Gently, press out the LCD MODULE from the HINGE ASSEMBLY.

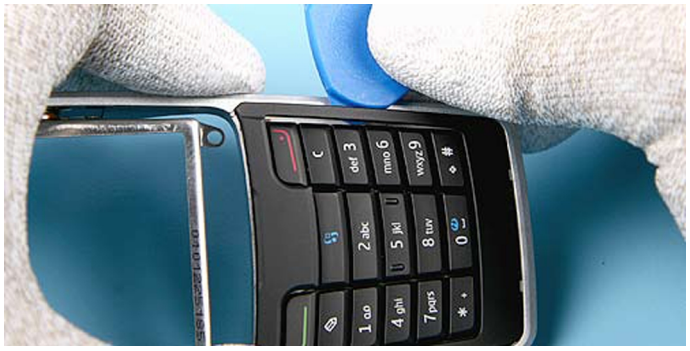


24. Remove the LCD MODULE paying attention to the COAX CABLE.



25. Unlock the T9 COVER in the order shown.

26. Continue on the other side.



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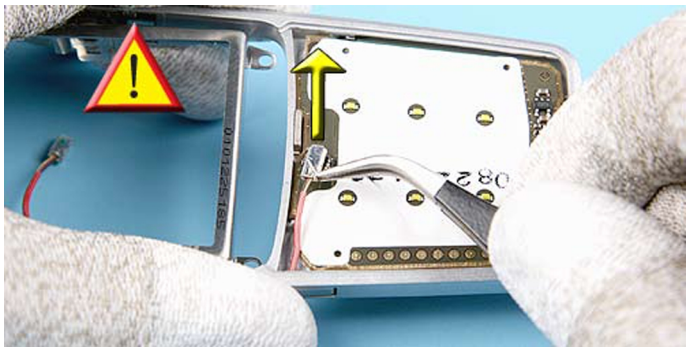
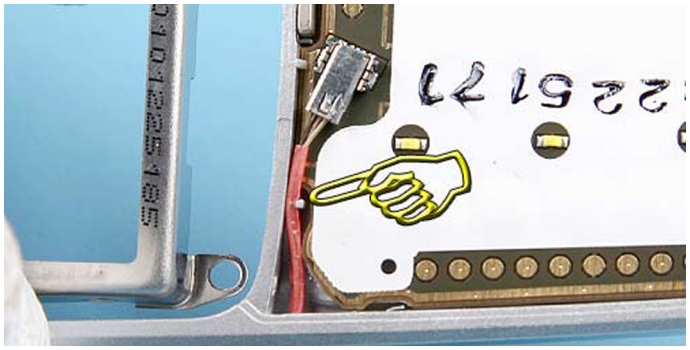
27. Pull up the T9 COVER and remove it.

28. Remove the T9 KEYMAT.

29. Open the COAX CABLE connector with angled tweezers.



30. **For assembly only!** Note the correct position of the COAX CABLE when reassembling the unit.



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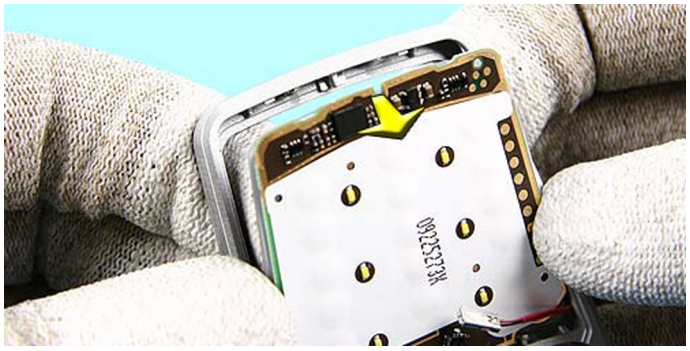
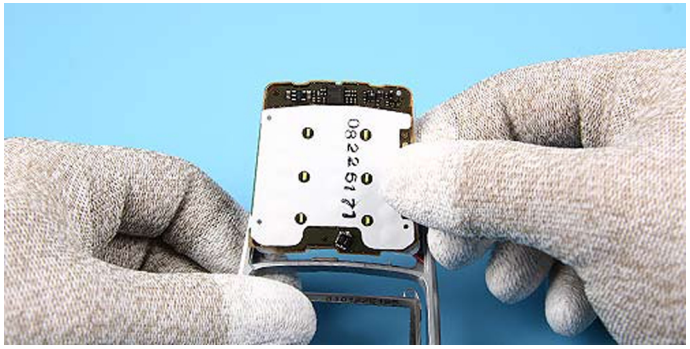
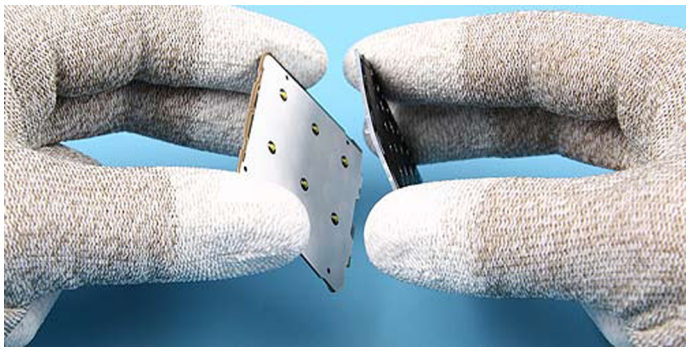
31. Press out the FLIP PWB ASSEMBLY.



32. Remove the modules from the FLIP FRAME.

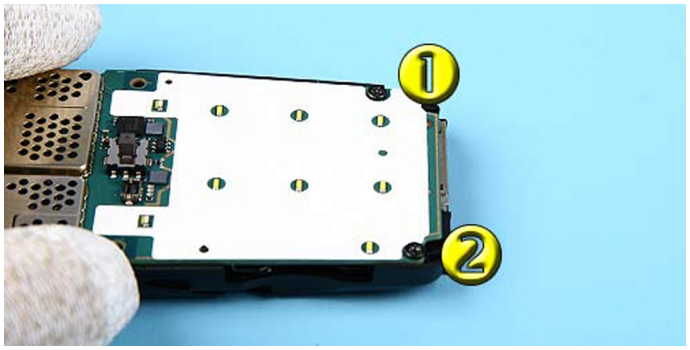


33. Separate the FLIP QWERTY KEYMAT from the FLIP PWB ASSEMBLY.



34. Unscrew the two Torx Plus size 6 SCREWS in the order shown.

Note: For assembly use a reverse order and Torque driver with a torque setting of 21Ncm.



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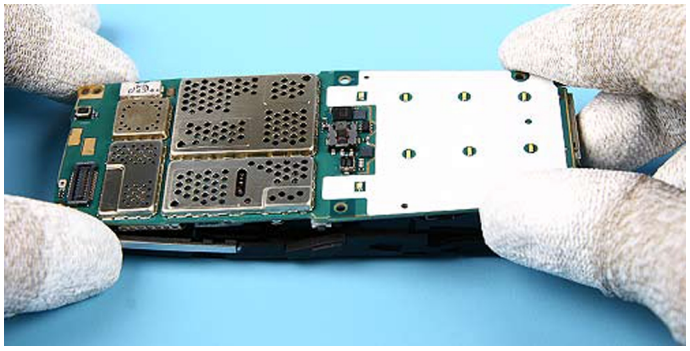
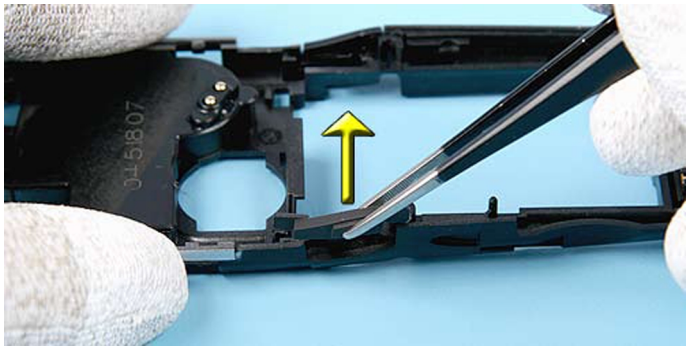
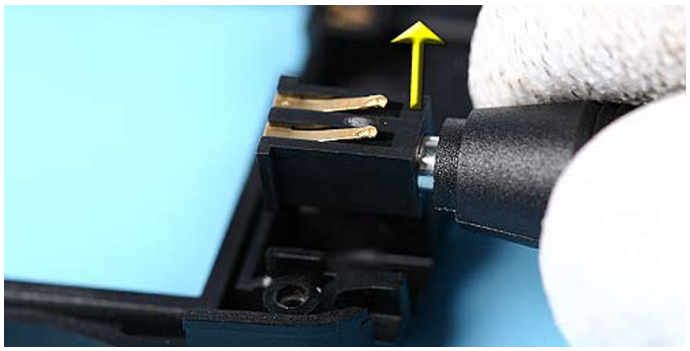
35. Remove the ENGINE MODULE from the B-COVER.



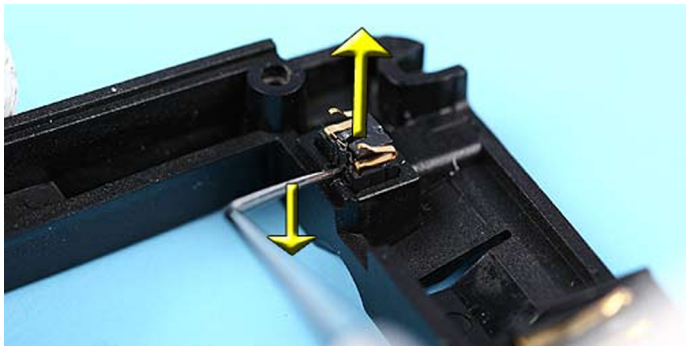
36. Remove the VOICE KEY.



37. Remove the DC- JACK with the DC-Plug.



38. Use the dental tool as a lever to remove the MICROPHONE. Do not reuse the MICROPHONE.



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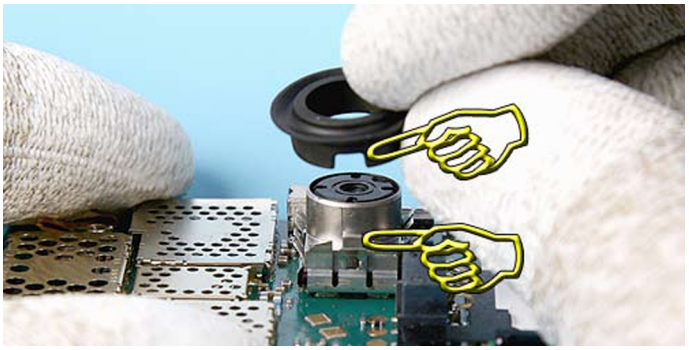
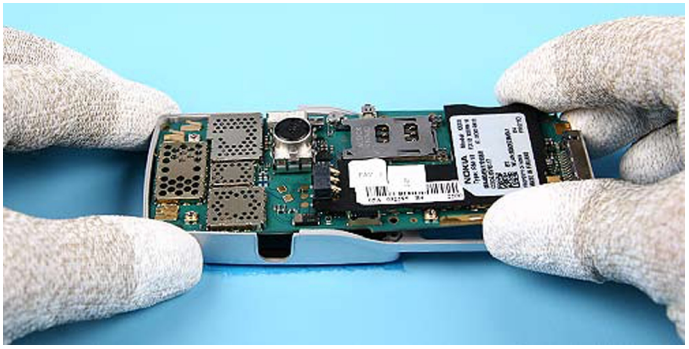
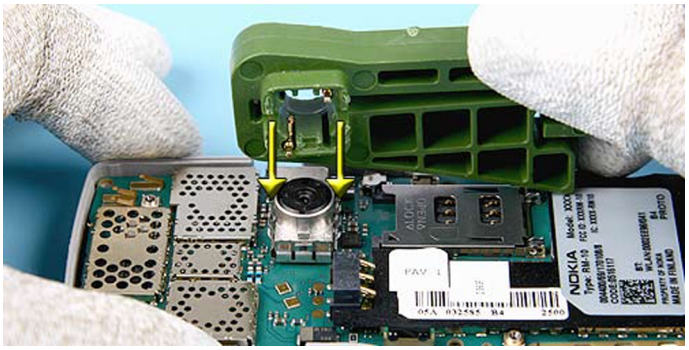
39. Remove the CAMERA GASKET.



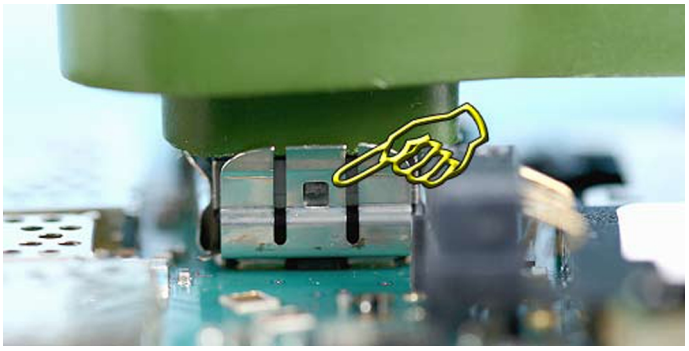
40. Use the A-COVER as a support when removing the CAMERA MODULE.



41. Note the correct position of the SS-15 before placing it over the CAMERA MODULE.



42. Press the SS-15 lightly in shown direction until the CAMERA MODULE have been unlocked.



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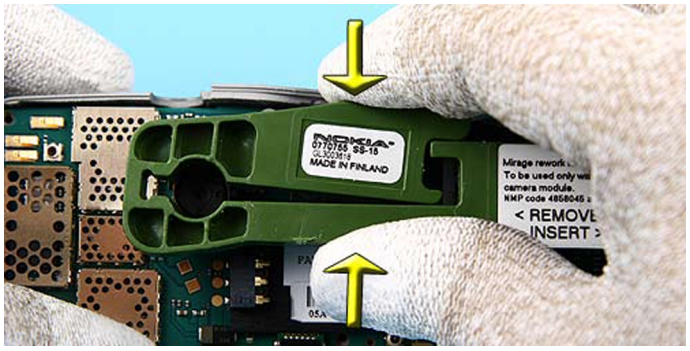
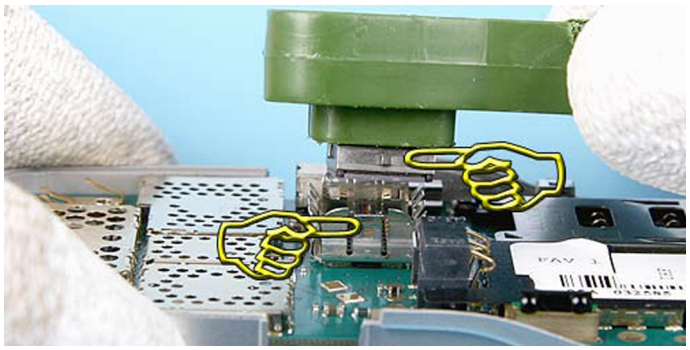
43. Press the Camera removal tool together.



44. Gently, remove the CAMERA MODULE. **Note the correct position of the Camera when reassembling the unit.**



45. Remove the BATTERY DECK. Do not use to much force.

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6 — BB Troubleshooting and Manual Tuning Guide

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Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths. The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

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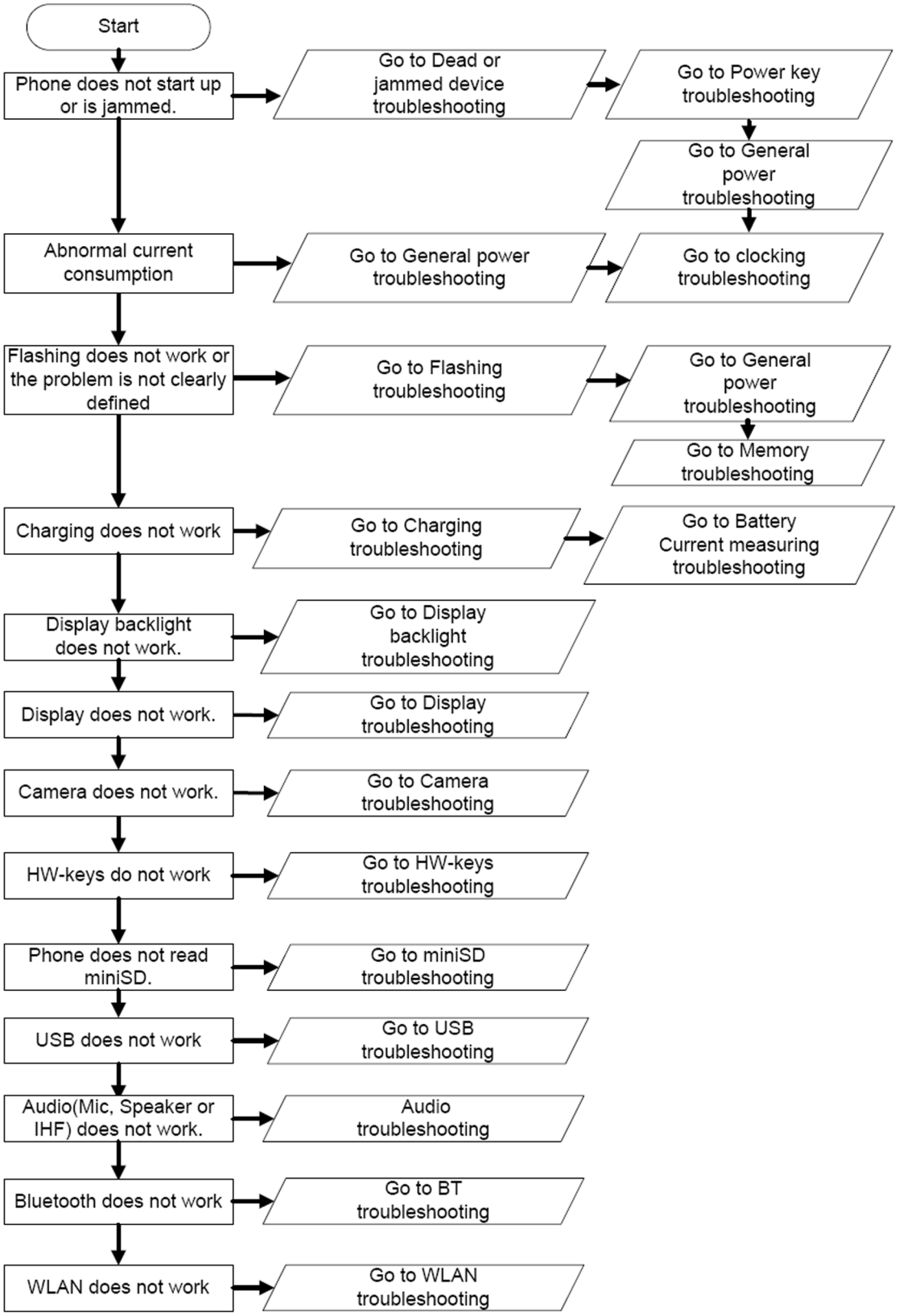
Troubleshooting flow



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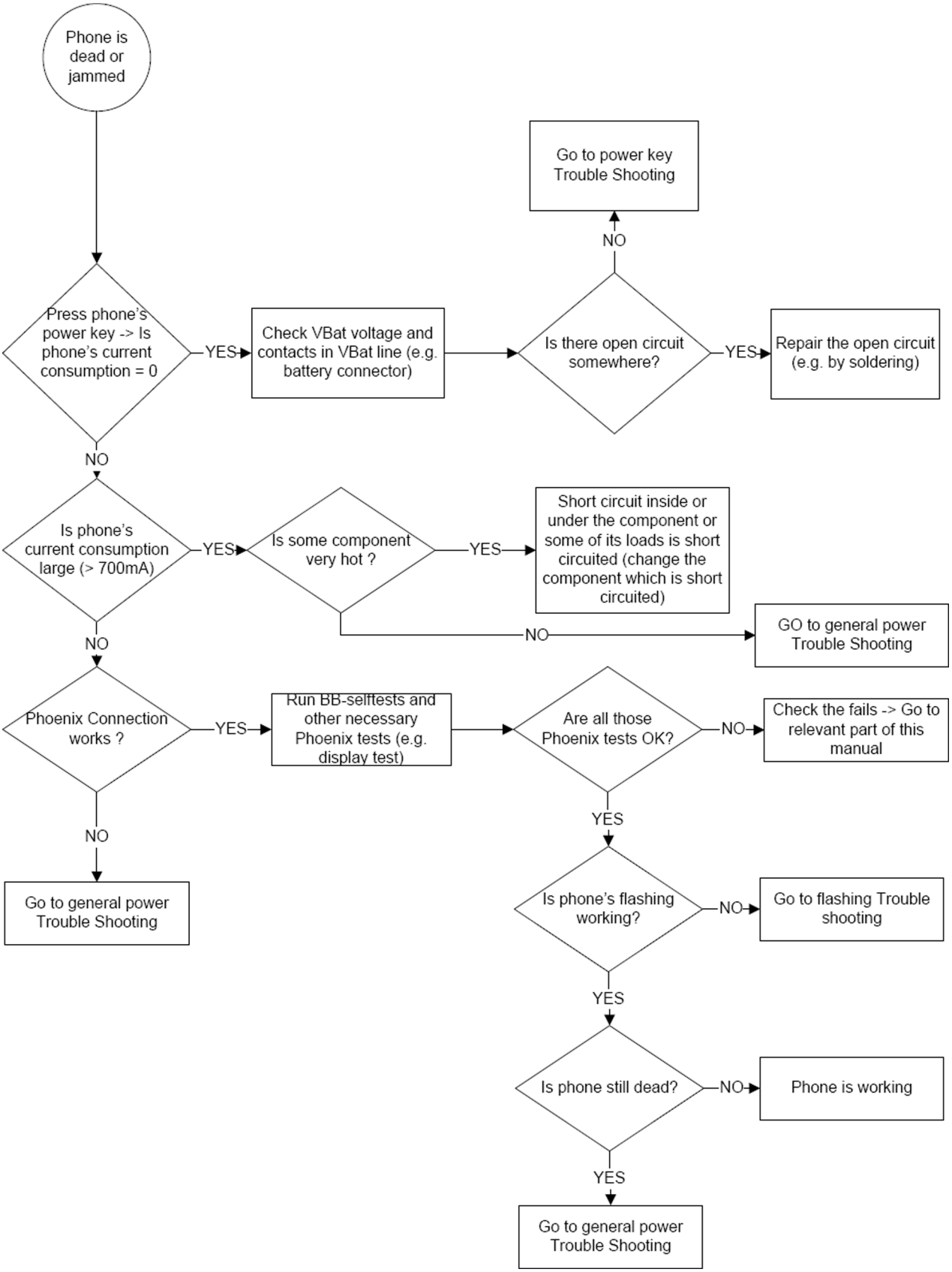
Dead or jammed device troubleshooting

Troubleshooting flow



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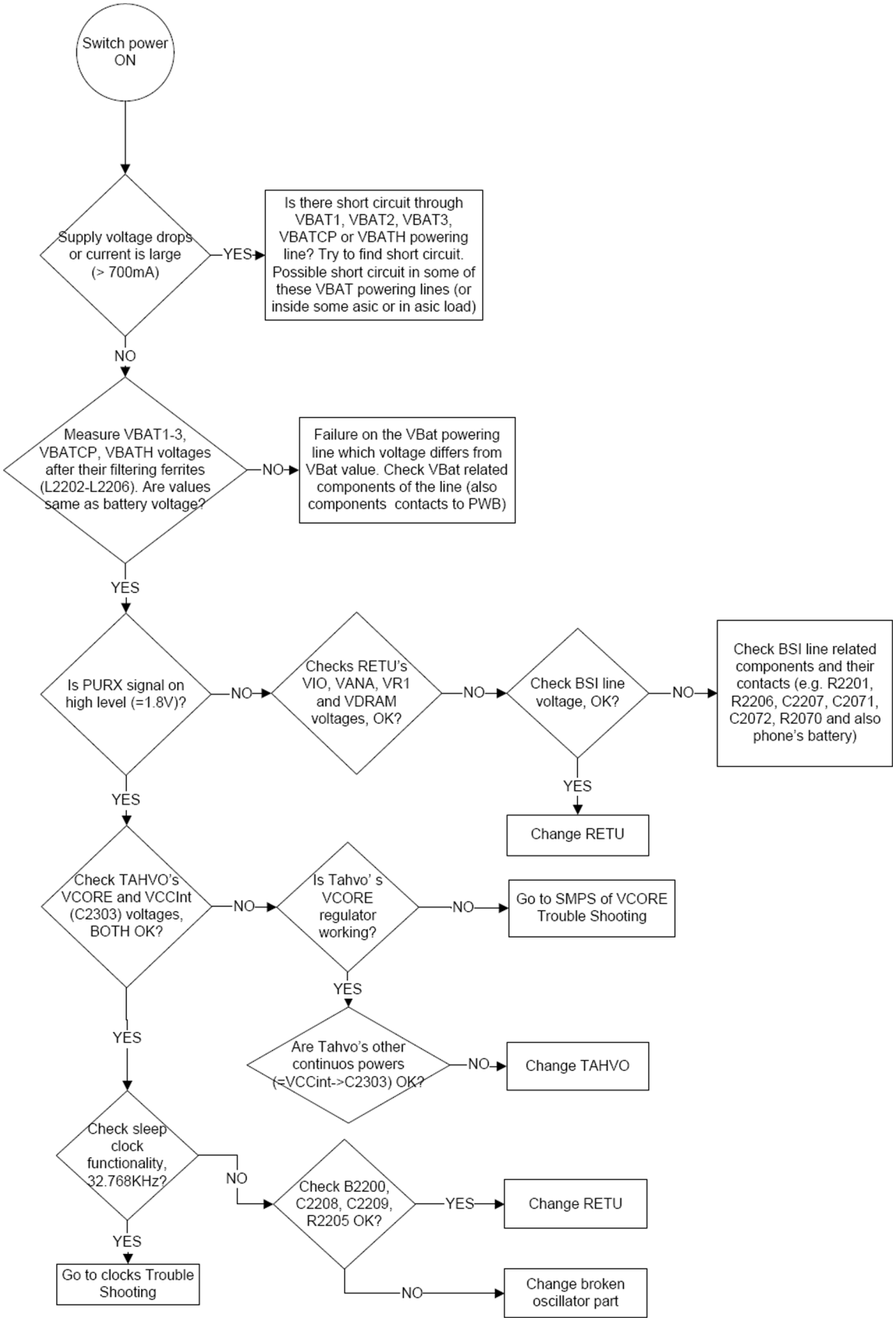
General power checking troubleshooting

Troubleshooting flow



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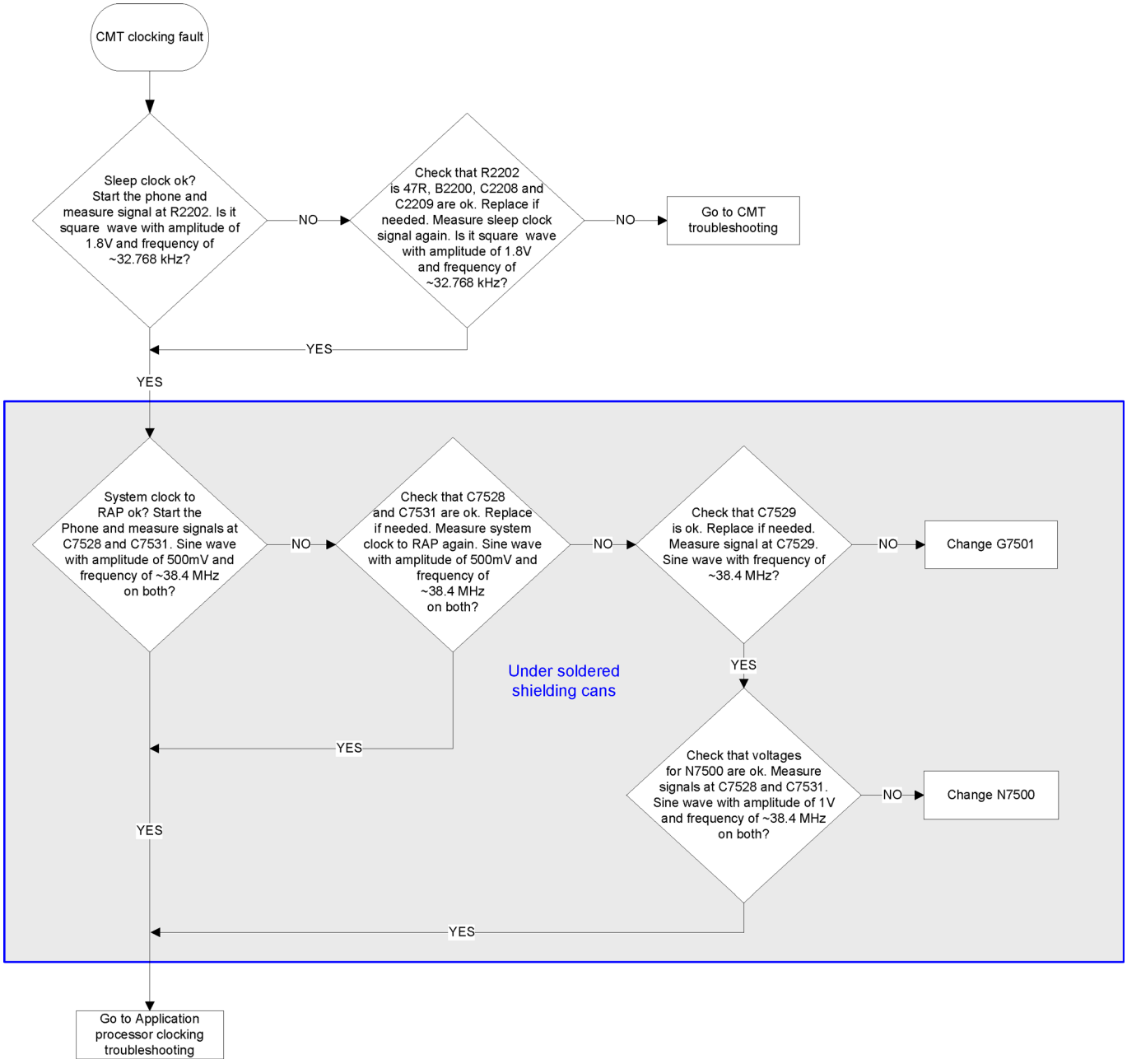
CMT and application processor clocking troubleshooting

Troubleshooting flow



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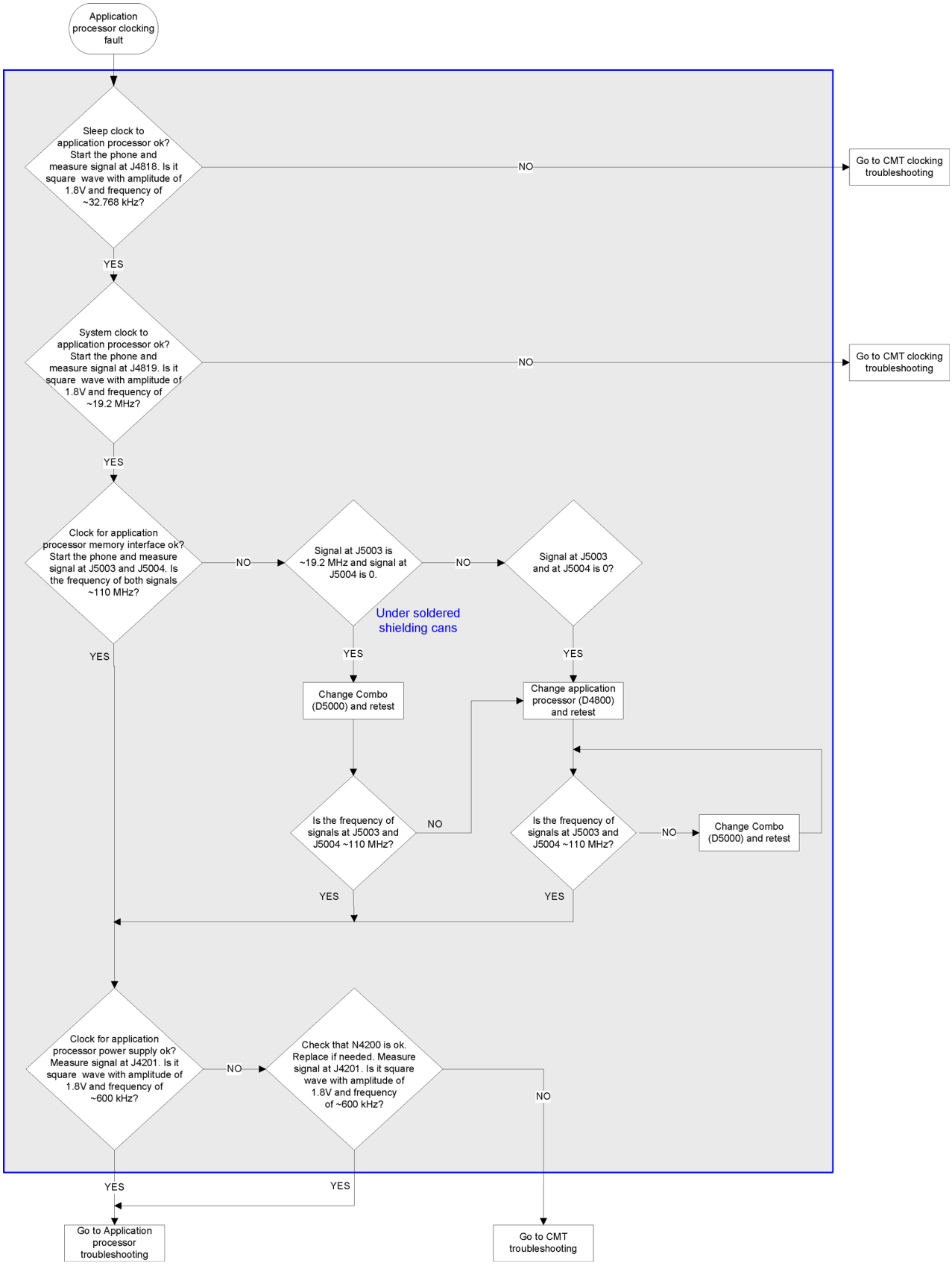

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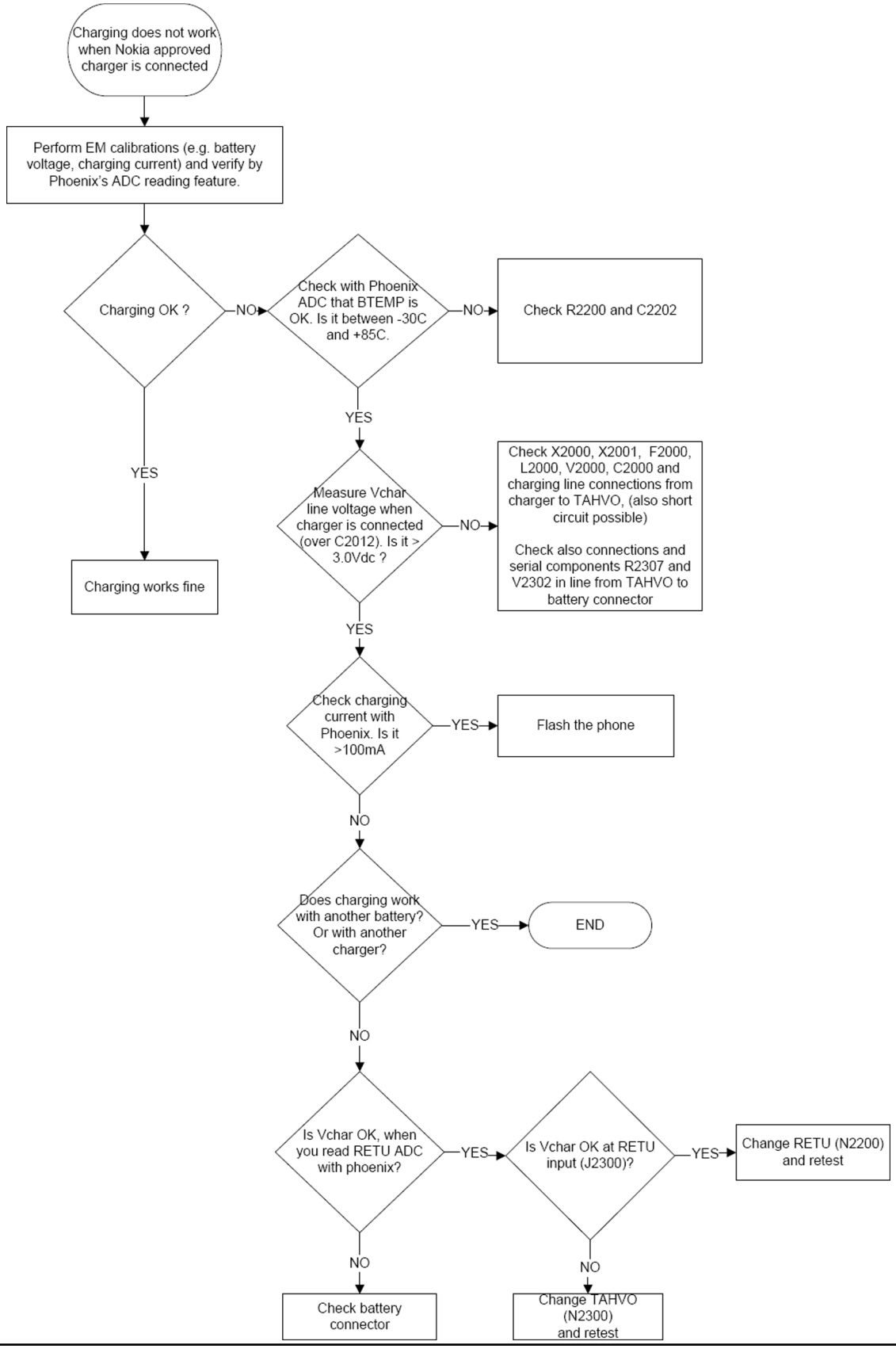
Charging troubleshooting

Troubleshooting flow



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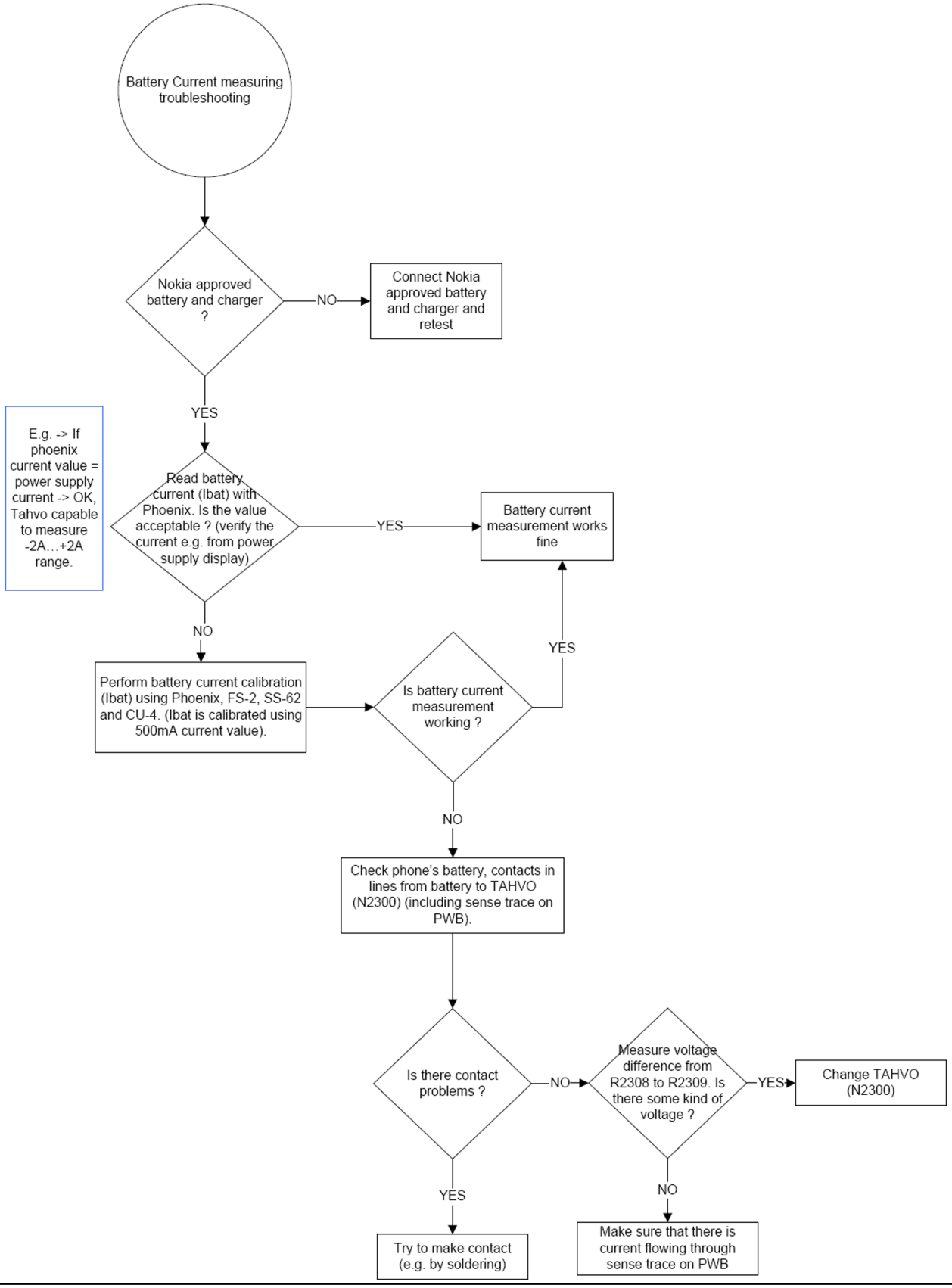
Battery current measuring fault troubleshooting

Troubleshooting flow



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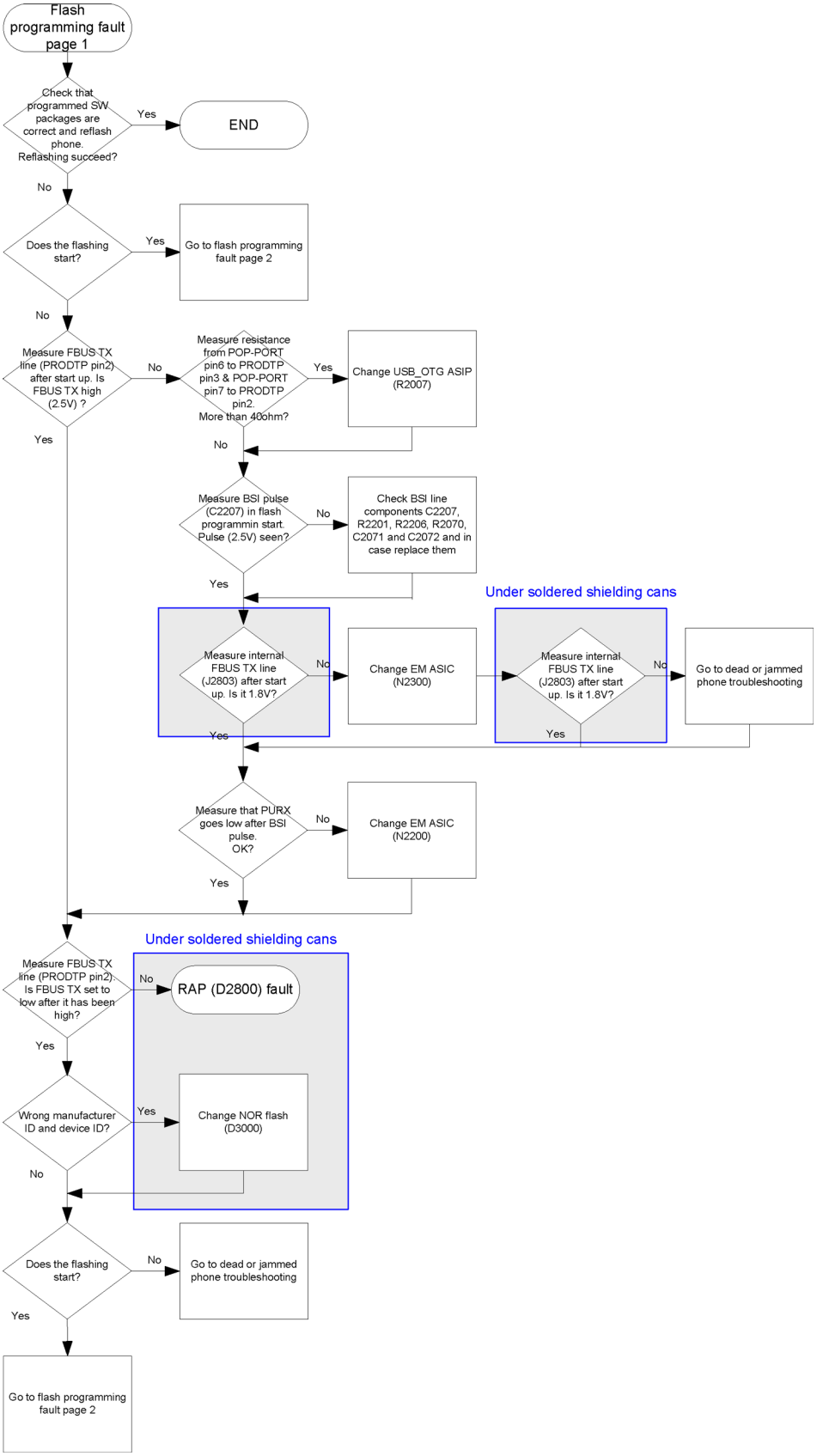
Flash programming fault troubleshooting

Troubleshooting flow



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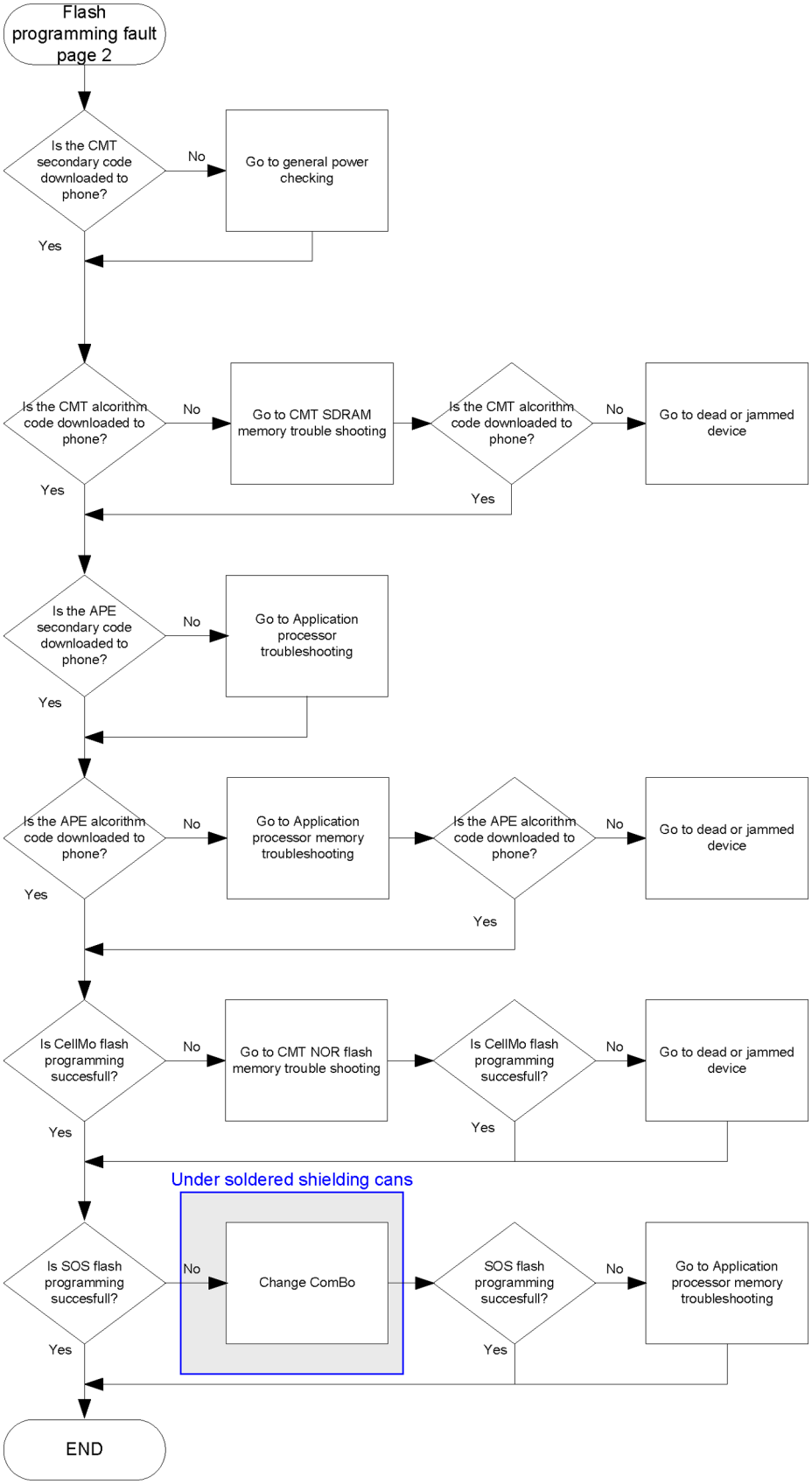

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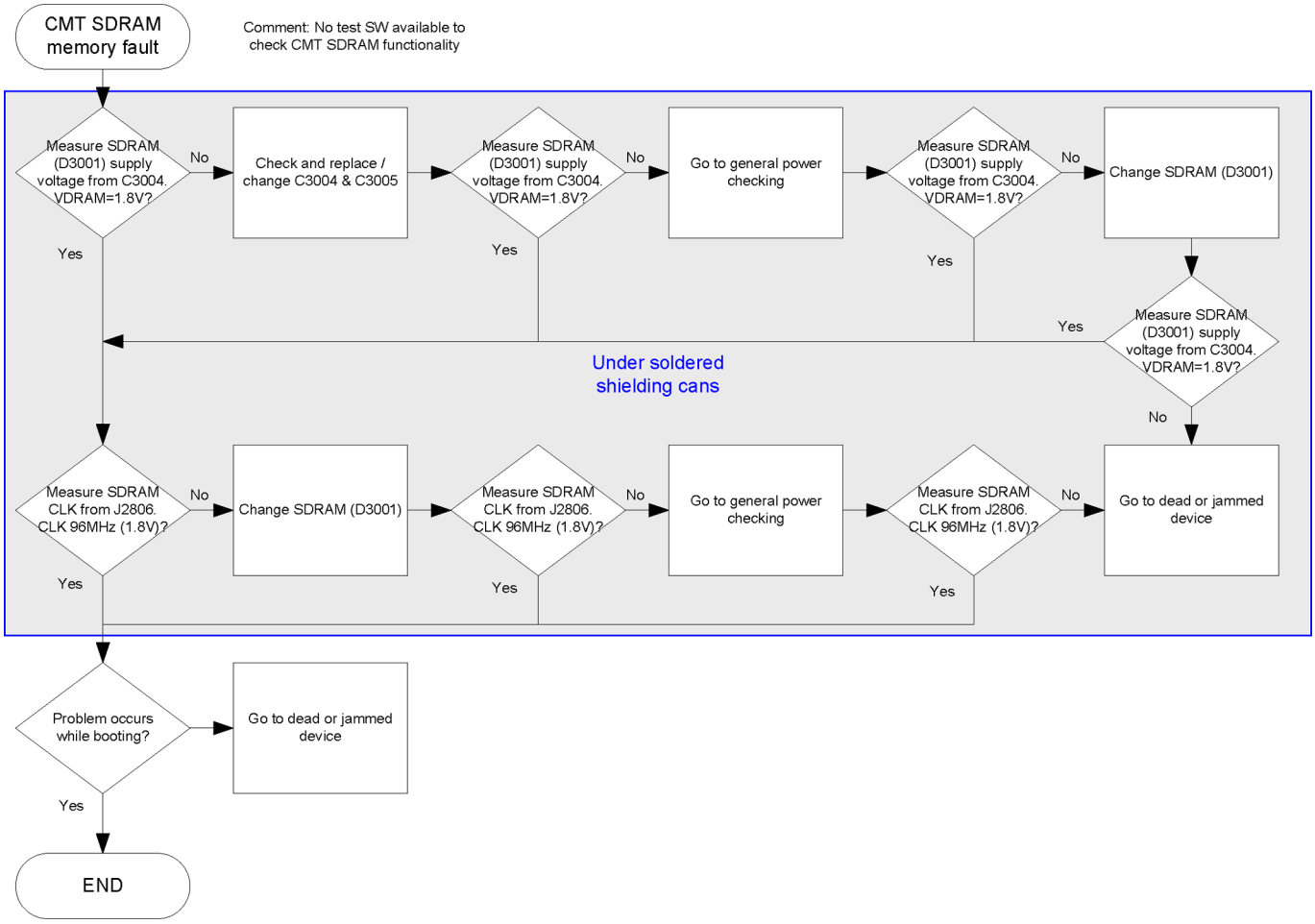
CMT SDRAM memory troubleshooting

Troubleshooting flow



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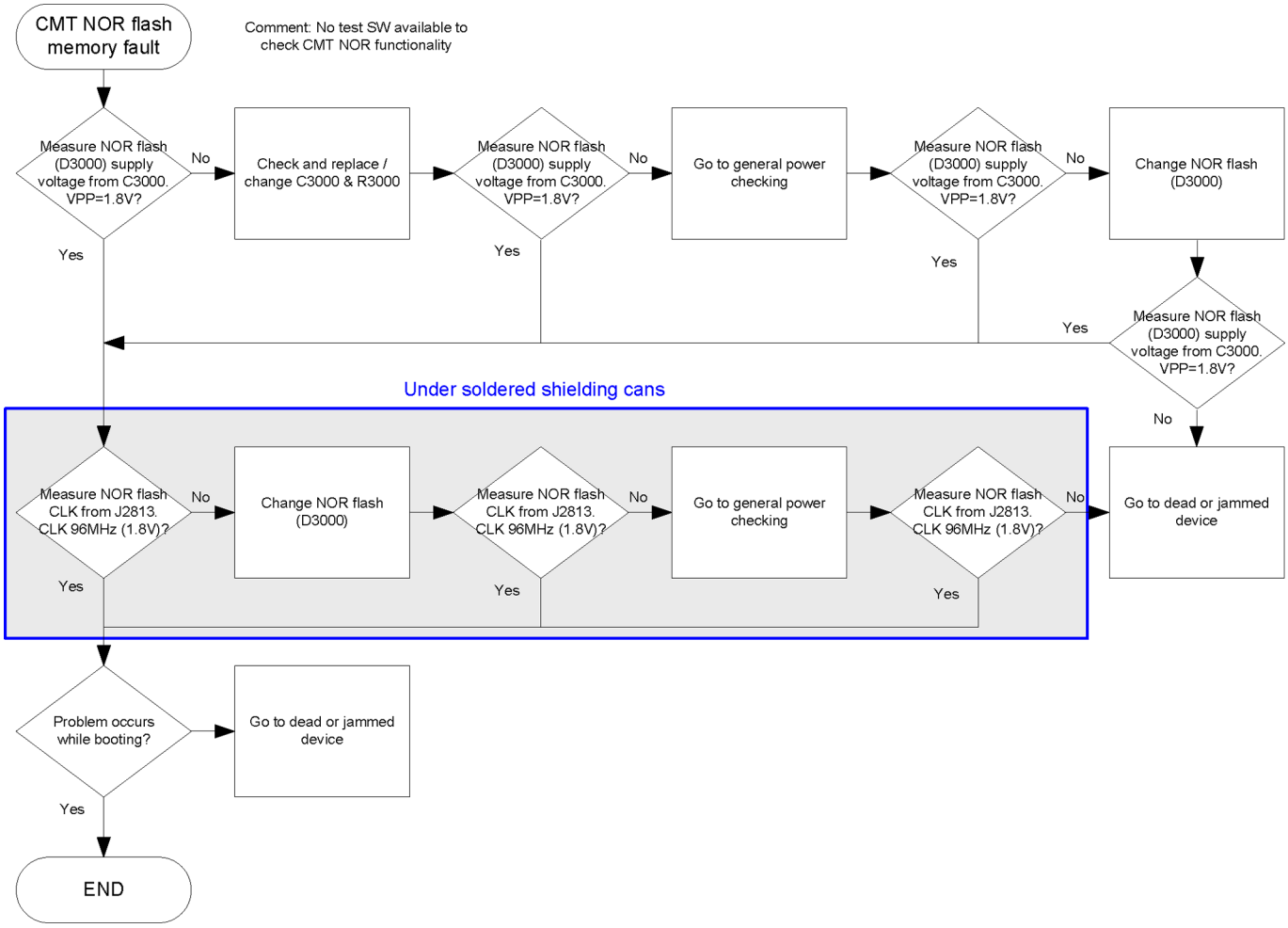
CMT NOR flash fault troubleshooting

Troubleshooting flow



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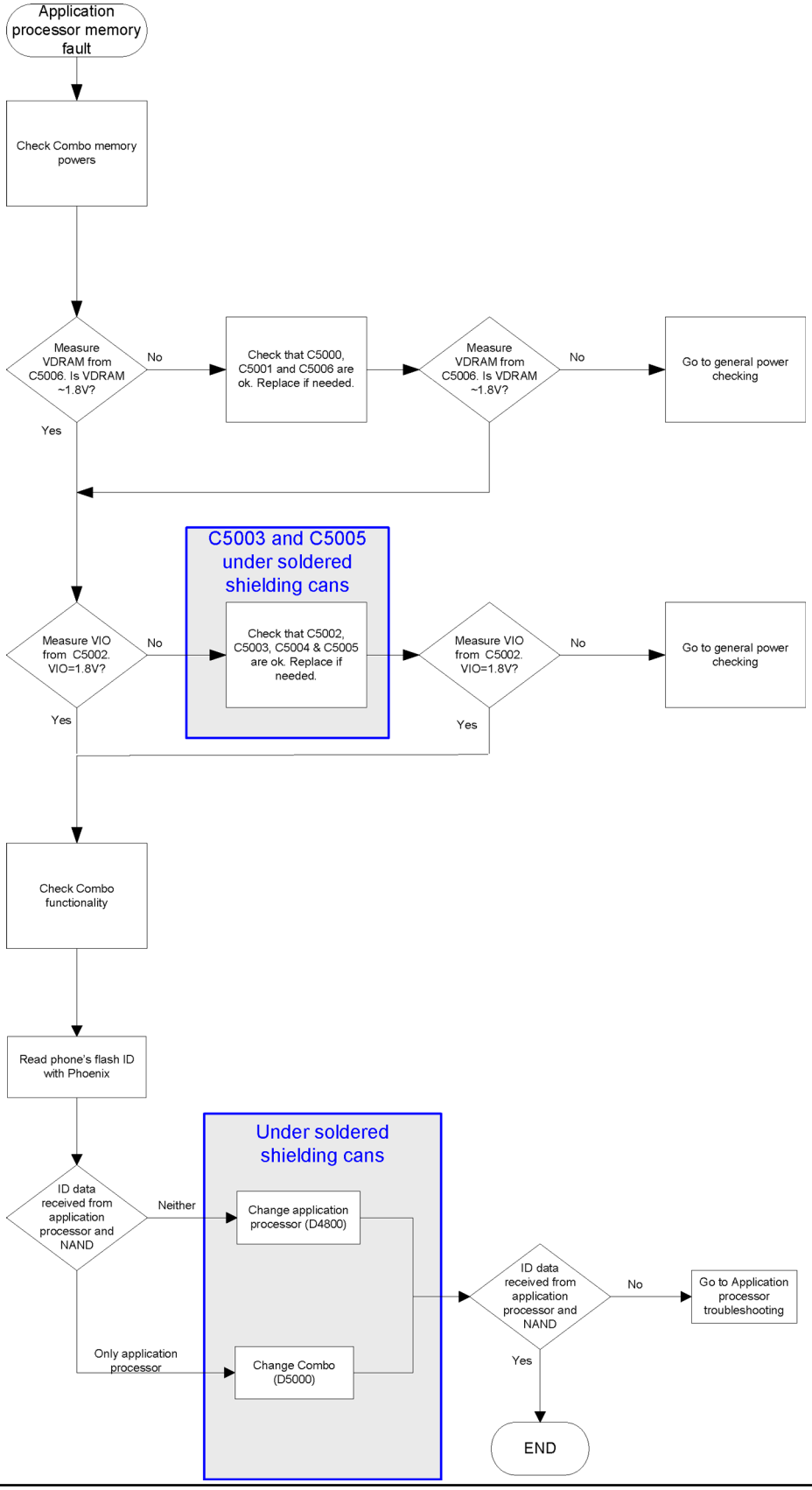
Application processor memory troubleshooting

Troubleshooting flow



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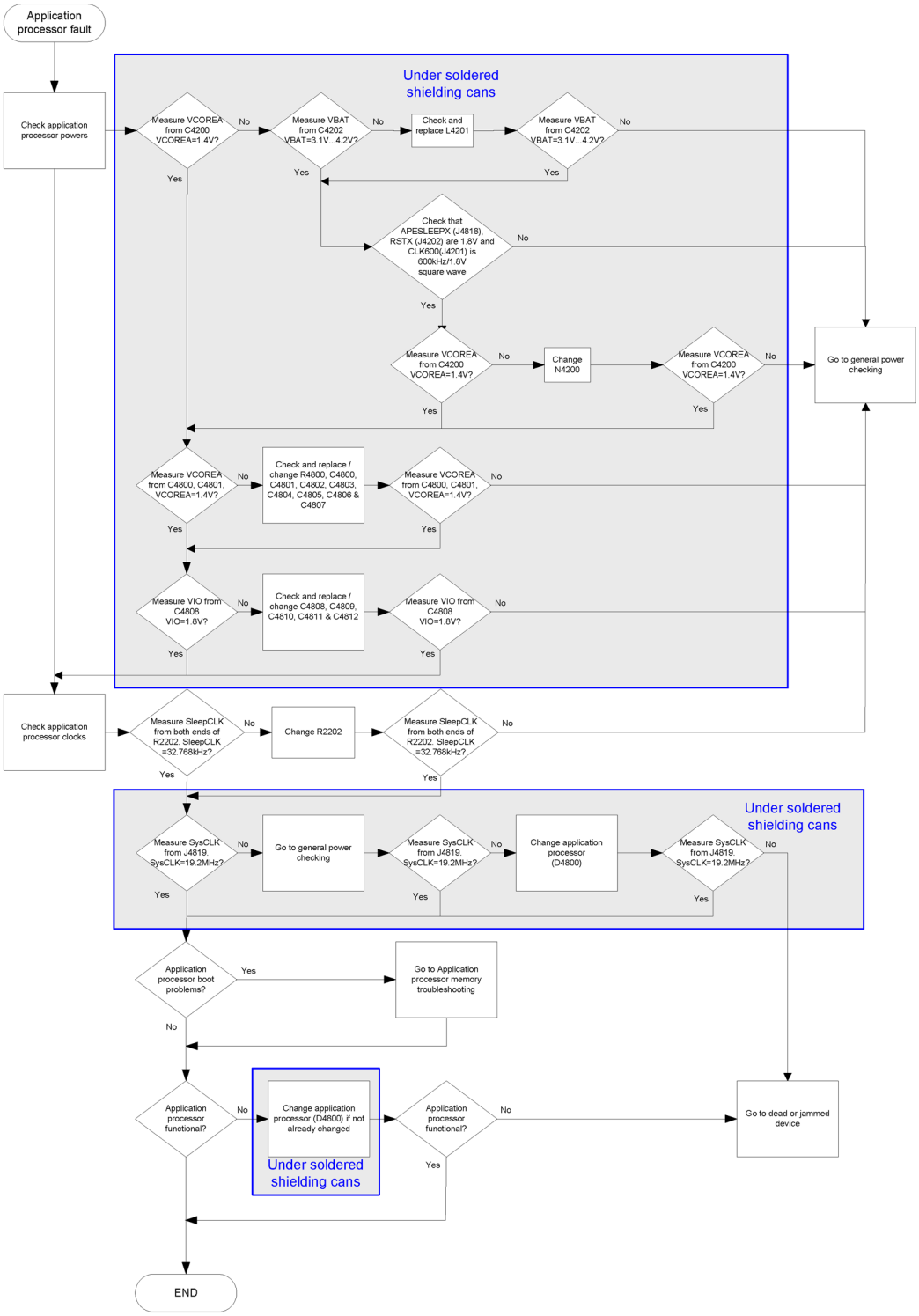
Application processor troubleshooting

Troubleshooting flow



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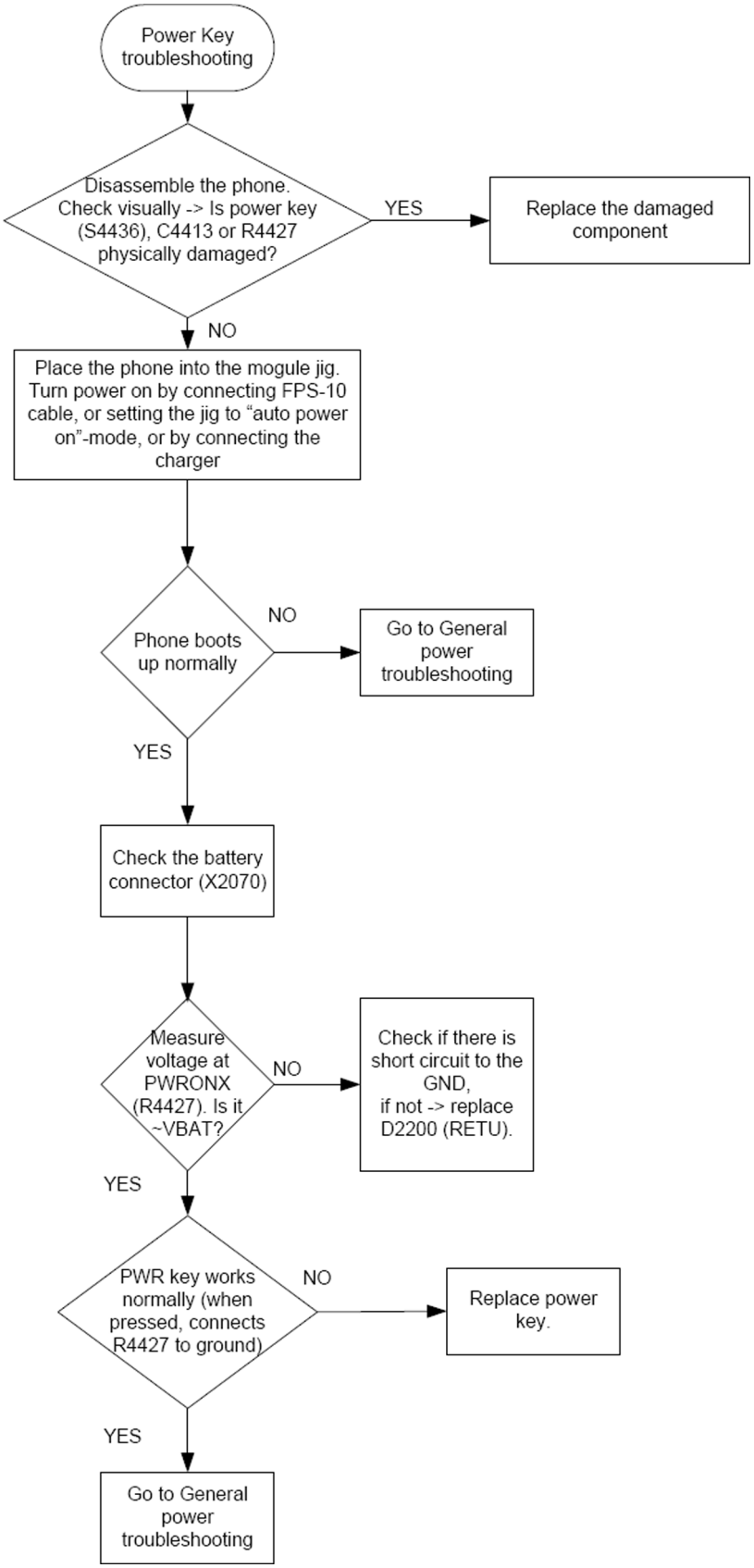
Power key troubleshooting

Troubleshooting flow



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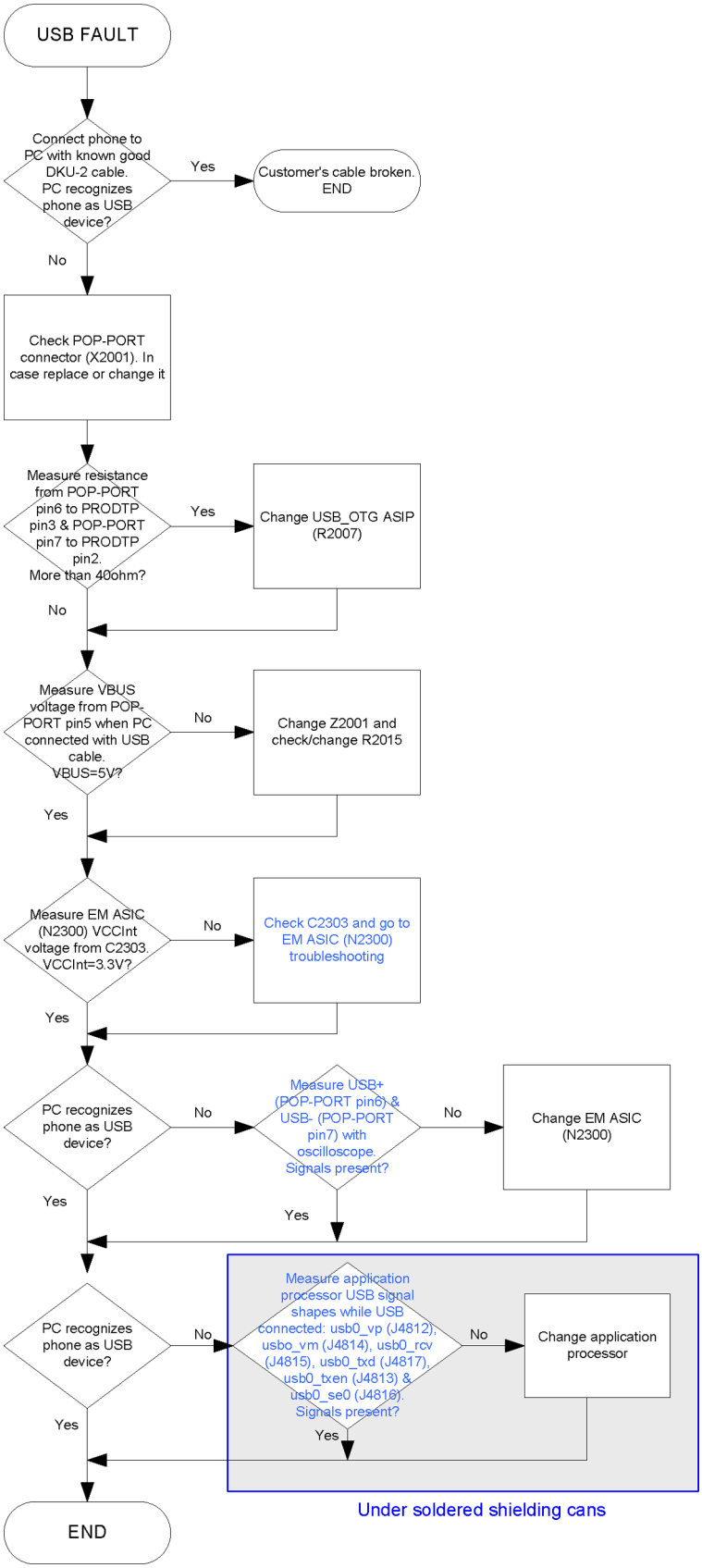
USB interface troubleshooting

Troubleshooting flow



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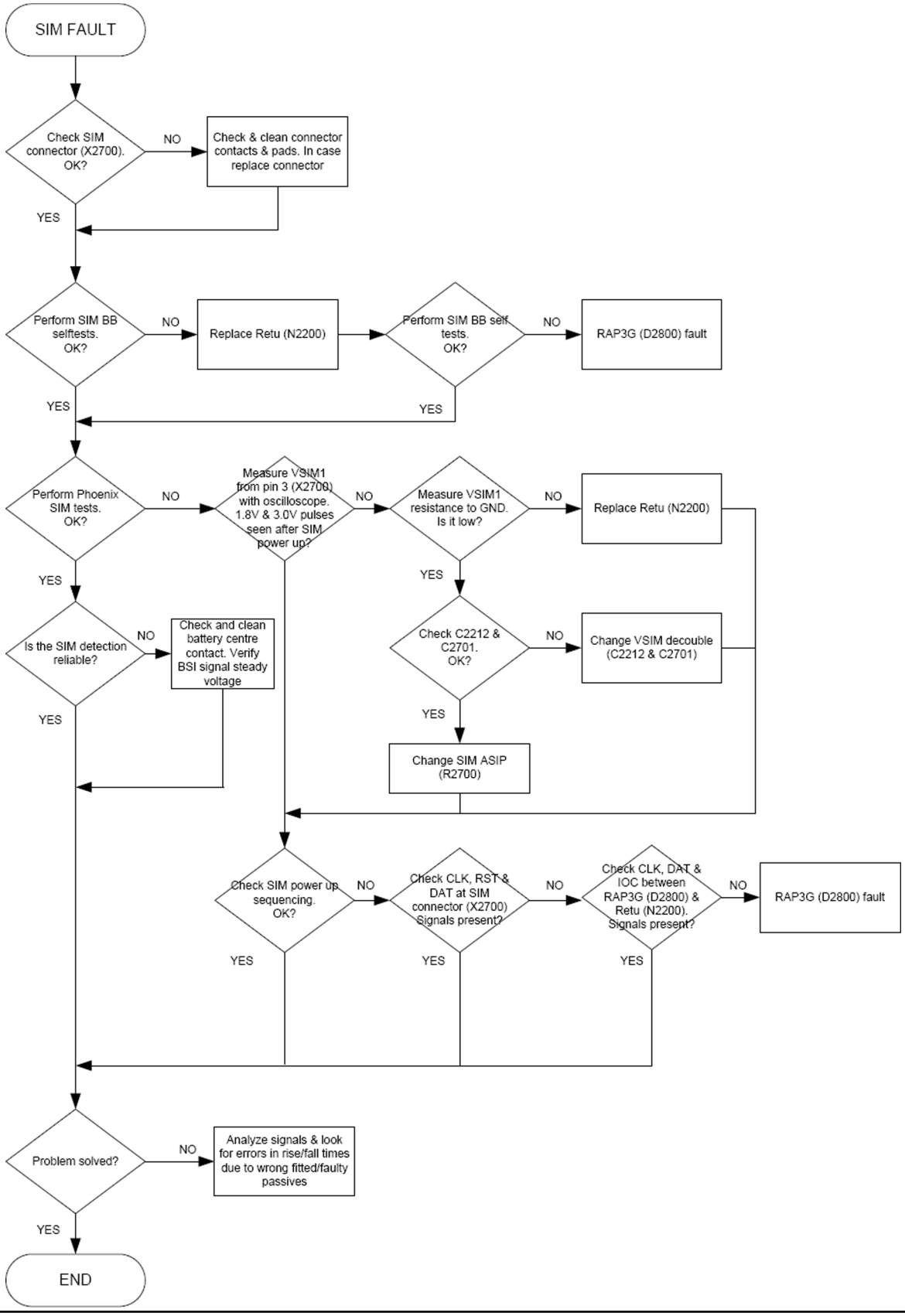
SIM card troubleshooting

Troubleshooting flow



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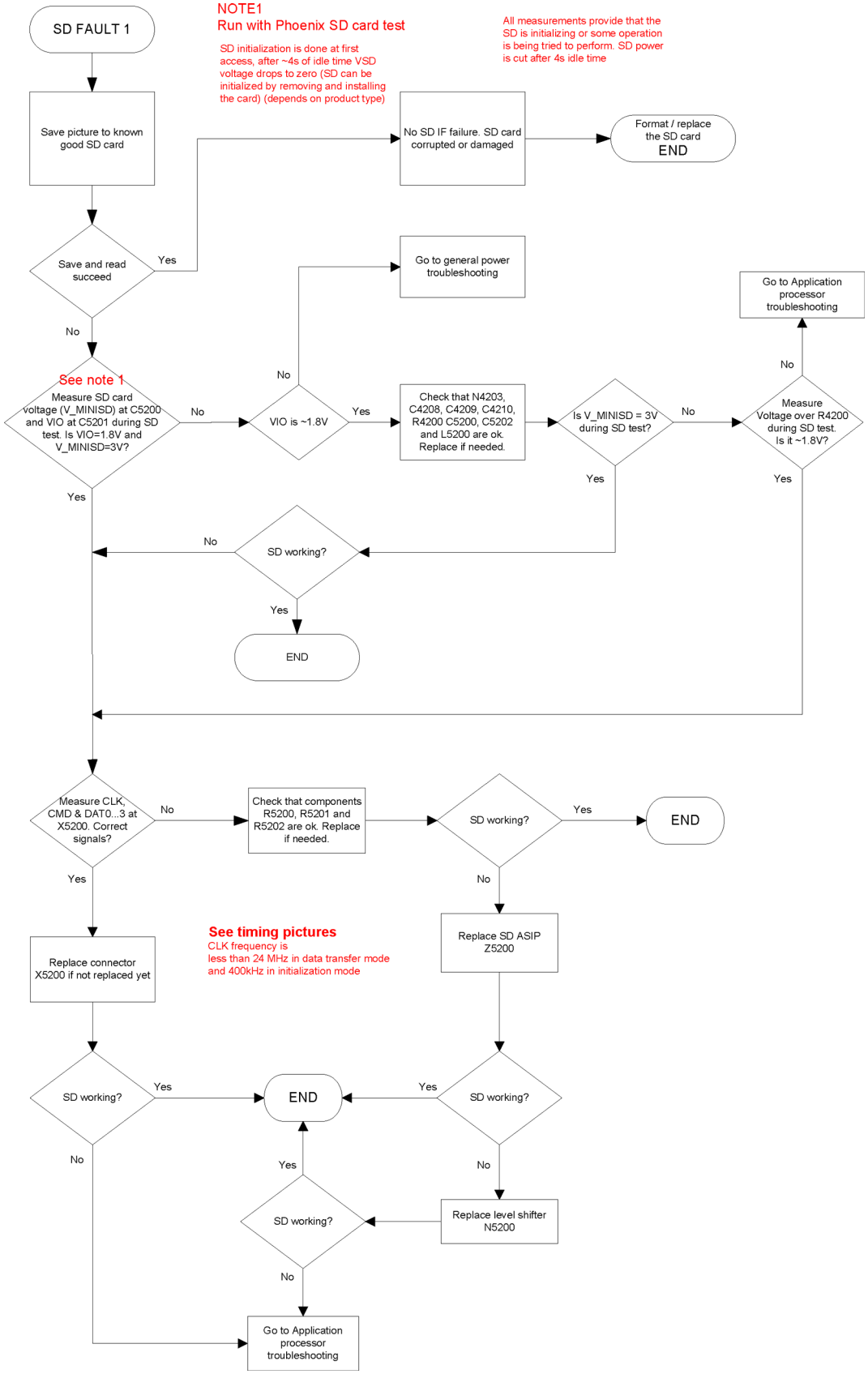
SD card troubleshooting

Troubleshooting flow



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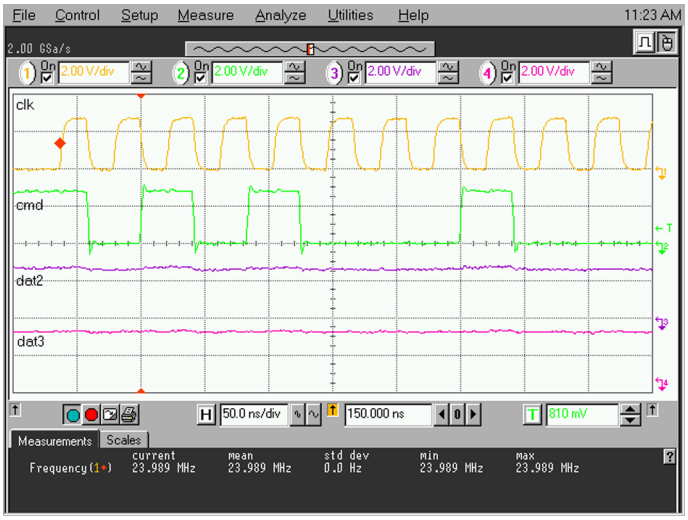

Figure 39 SD clk cdm diagram

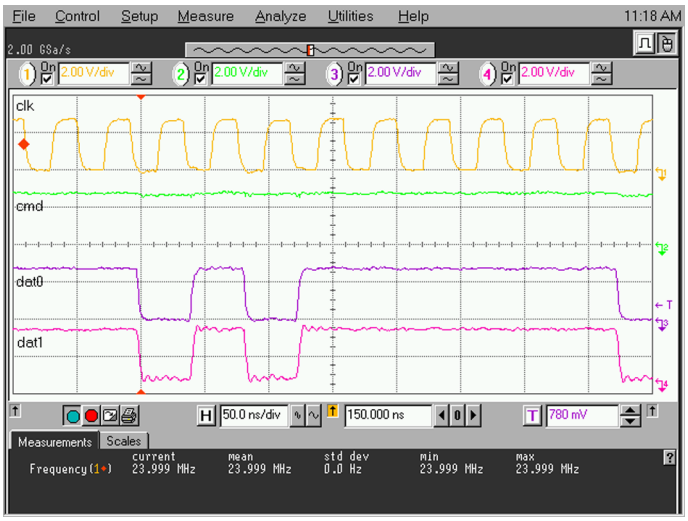

Figure 40 SD data 0_1 diagram

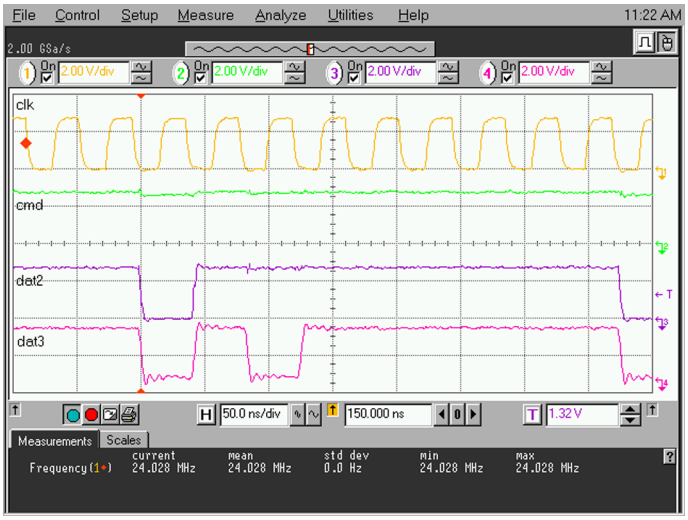

Figure 41 SD data 2_3 diagram

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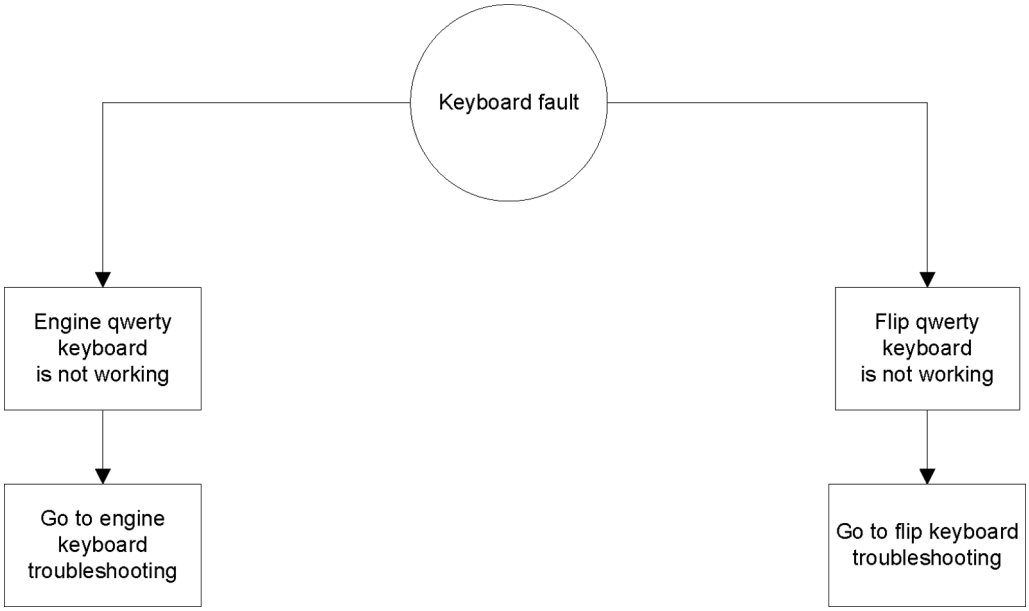
Keyboard troubleshooting

Troubleshooting flow



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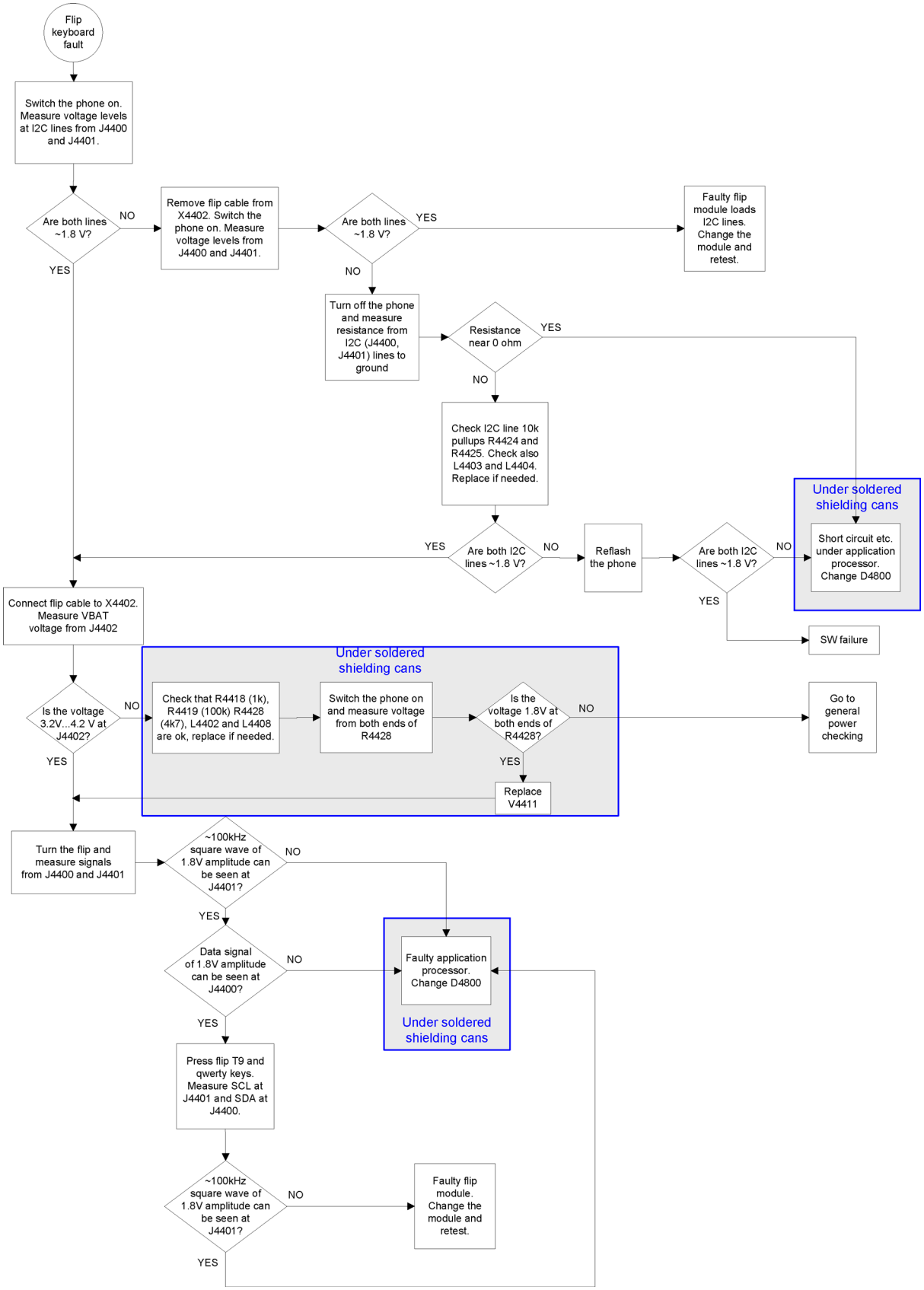
Flip keyboard troubleshooting

Troubleshooting flow



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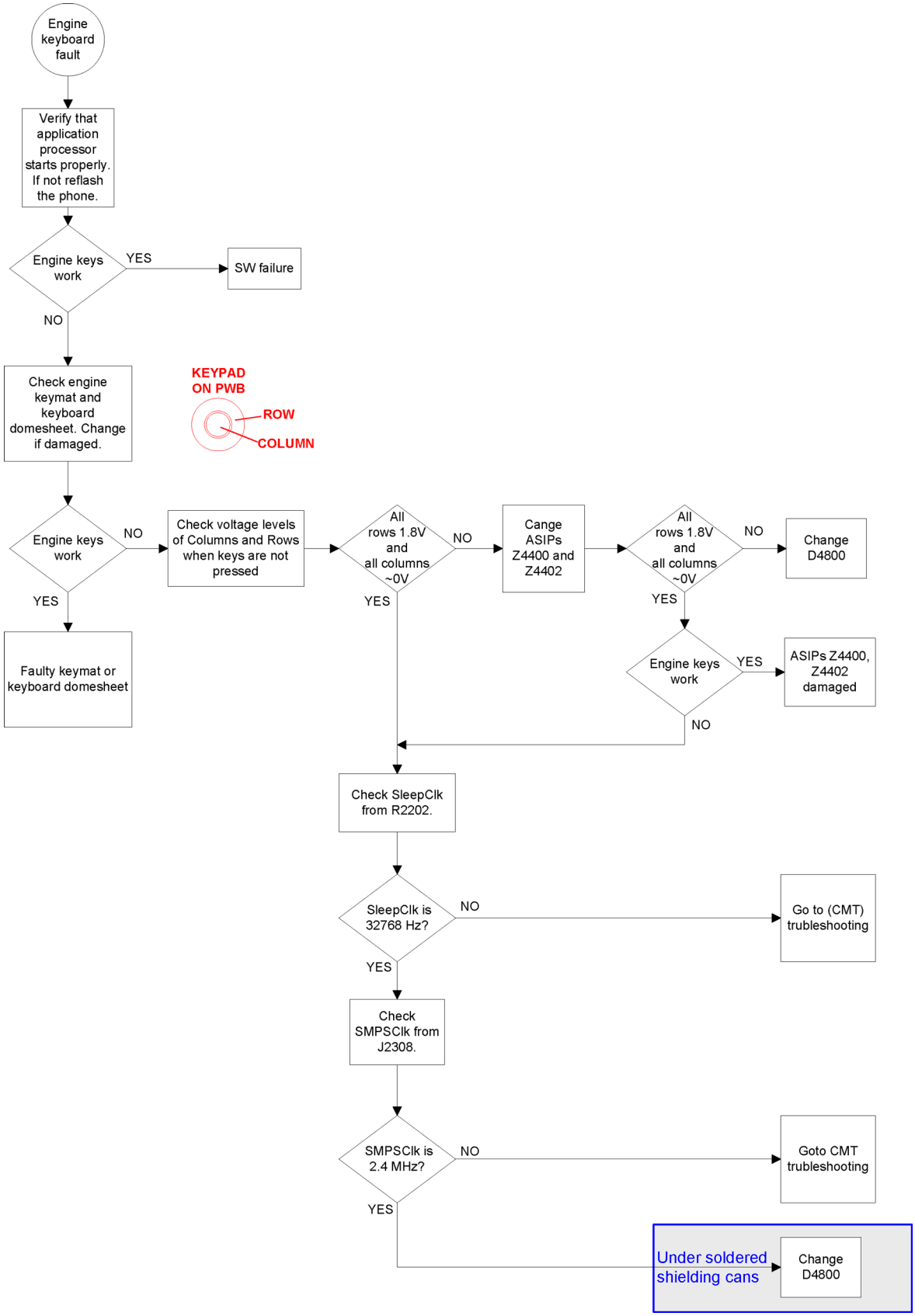
Engine keyboard troubleshooting

Troubleshooting flow



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Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a partial idle mode when the phone is in the screen saver mode.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 5 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 6 Pixel defects

<table>
<tr><th>Item</th><th></th><th colspan="4">White dot defect</th><th>Black dot defect</th><th>Total</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Defect counts</td><td>R</td><td>G</td><td>B</td><td>White Dot Total</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>2</td><td>Combined defect counts</td><td colspan="6">Not allowed.
Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.</td></tr>
</table>

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Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.

2. Check that the cellular engine is working normally.
   i To check the functionality, connect the phone to a docking station.
   ii Start *Phoenix* service software.
   iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

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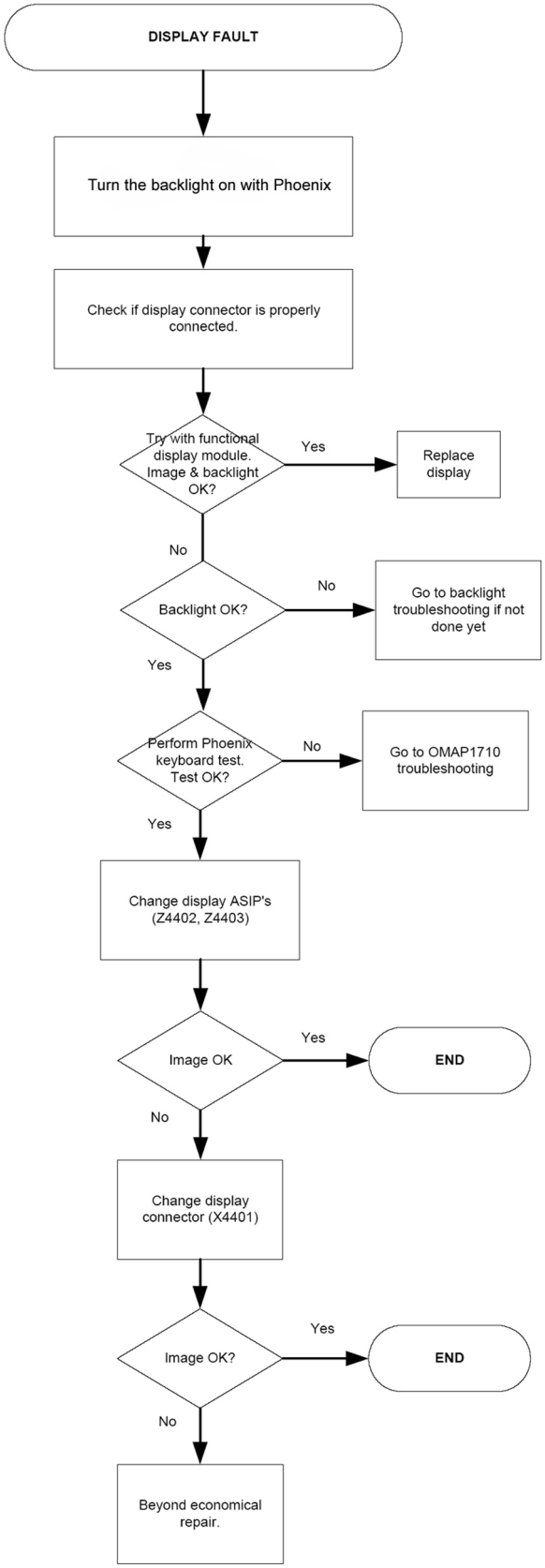
Display fault troubleshooting

Troubleshooting flow



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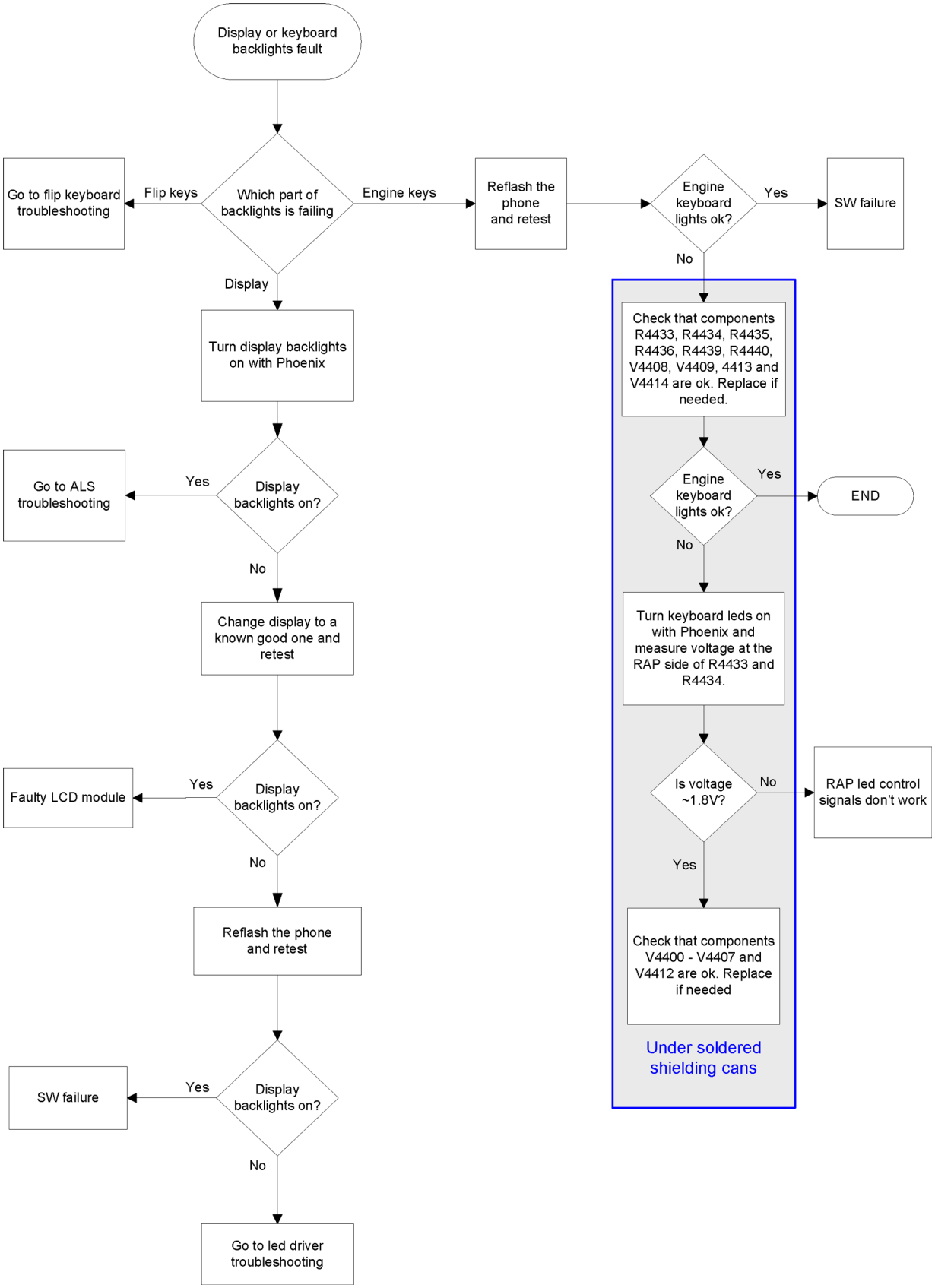
Display and keyboard backlight troubleshooting

Troubleshooting flow



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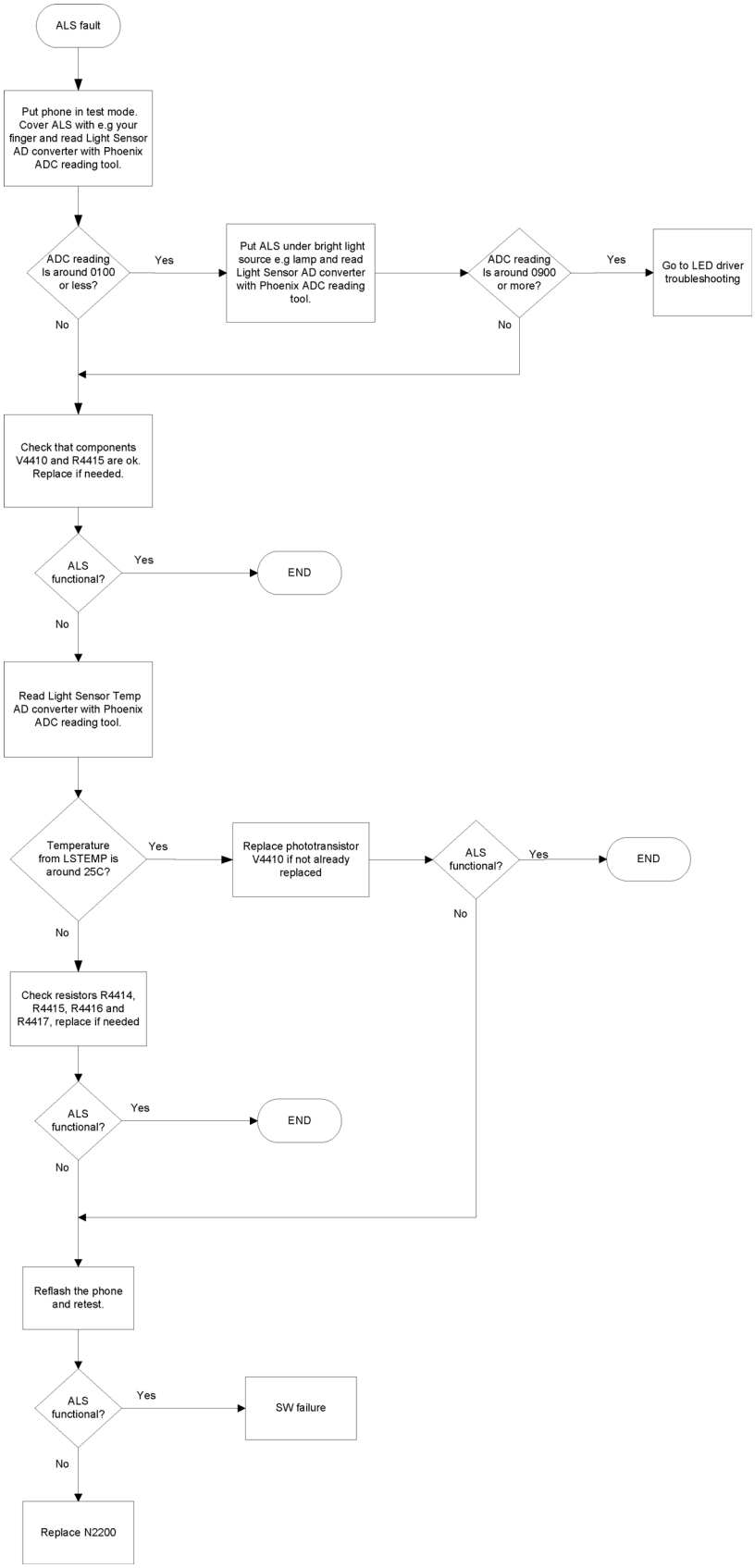
ALS troubleshooting

Troubleshooting flow



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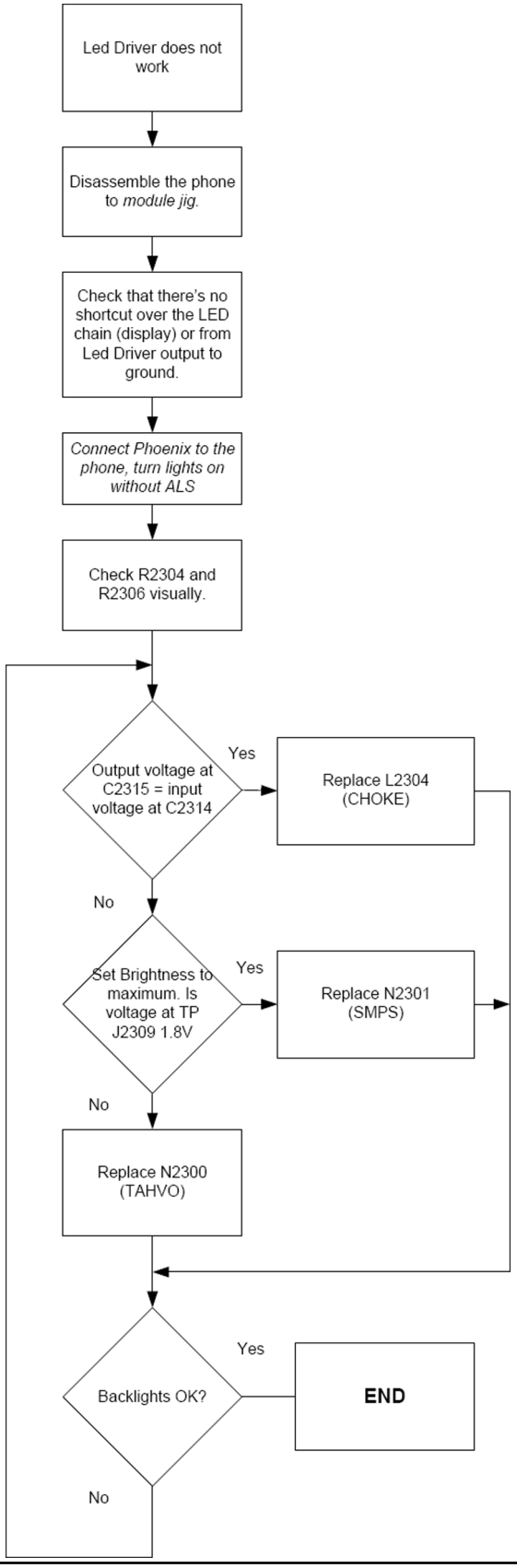
LED driver troubleshooting

Troubleshooting flow



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WLAN troubleshooting

Introduction to WLAN troubleshooting

The main problem that can occur is malfunction in WLAN or WLAN ASICs or WLAN SMD components. Such problems are unpredictable and may have many causes, either HW or SW related.

Note: When WLAN ASIC or WLAN/BTH front-end-module is changed, WLAN tuning is required. WLAN tuning is also required when permanent memory is replaced or corrupted. See tuning instructions for more information.

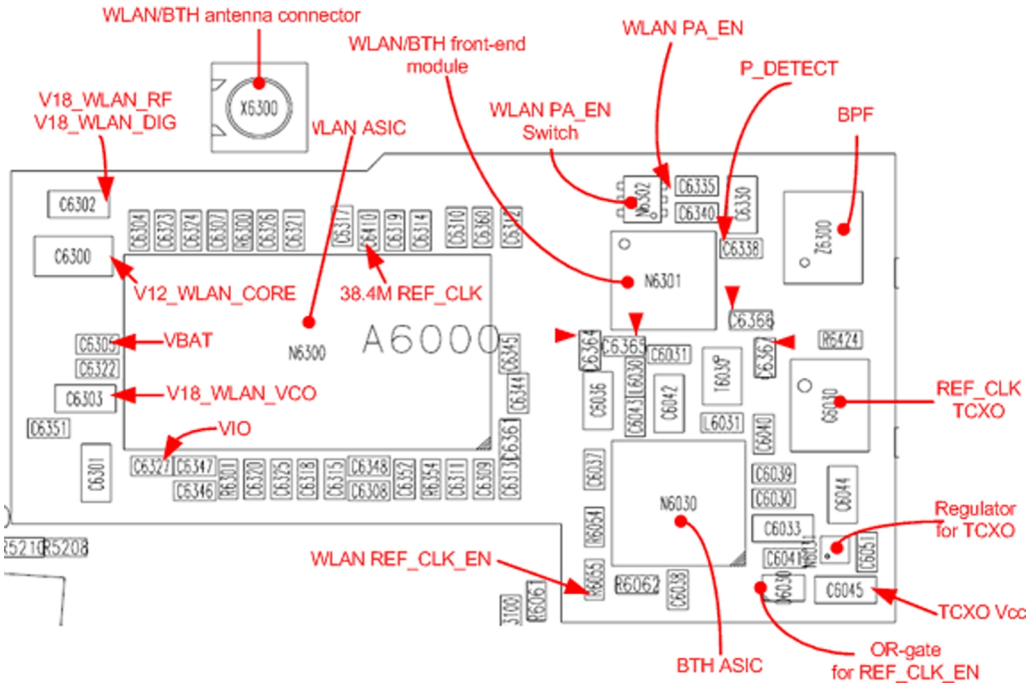
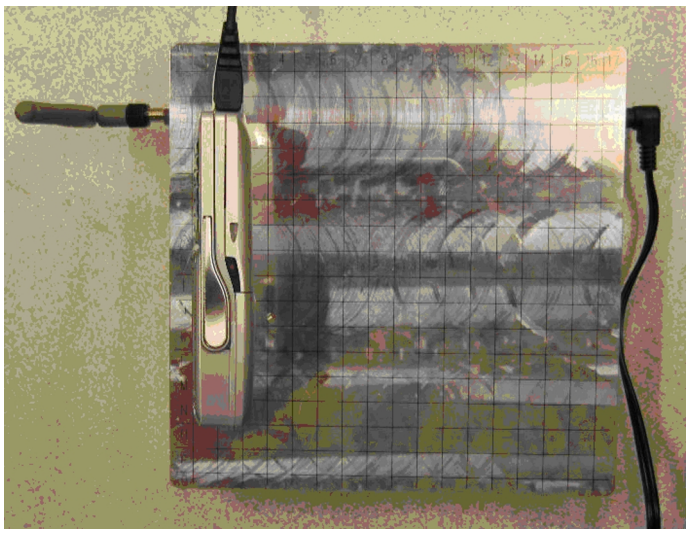


Figure 42 WLAN/BT layout

WLAN functionality testing using SB-7 and Phoenix

Steps

1. Place the phone on the **SB-7 WLAN test box**



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2. Start **Phoenix** service software and turn the phone to the local mode.
3. 3. From the **Testing menu**, choose **WLAN Configuration**, following window should pop up.
4. 4. Turn the power state on and press **Scan**
5. 5. After few seconds, list of found WLAN networks should be updated if WLAN is working, and at least station with SSID name default should be found and signal field should show value close to 75 (+/-10).

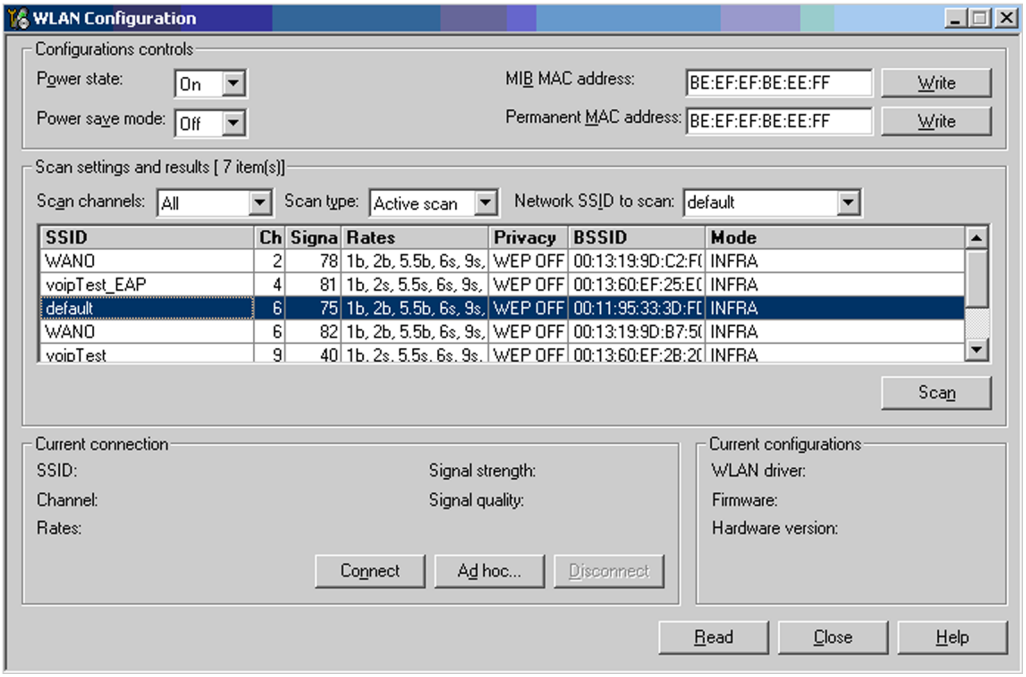

Figure 43 WLAN configuration

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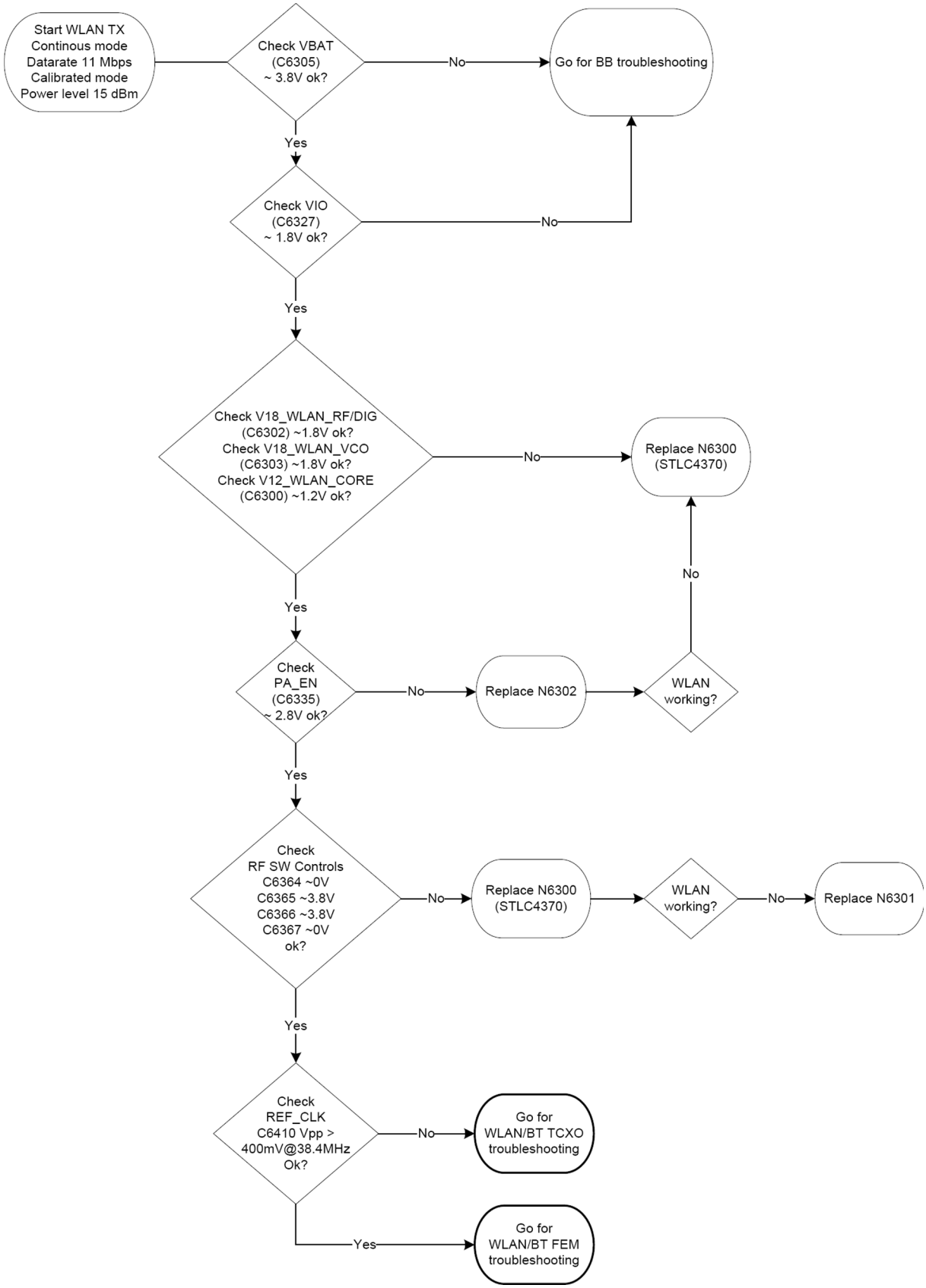
WLAN failure troubleshooting

Troubleshooting flow



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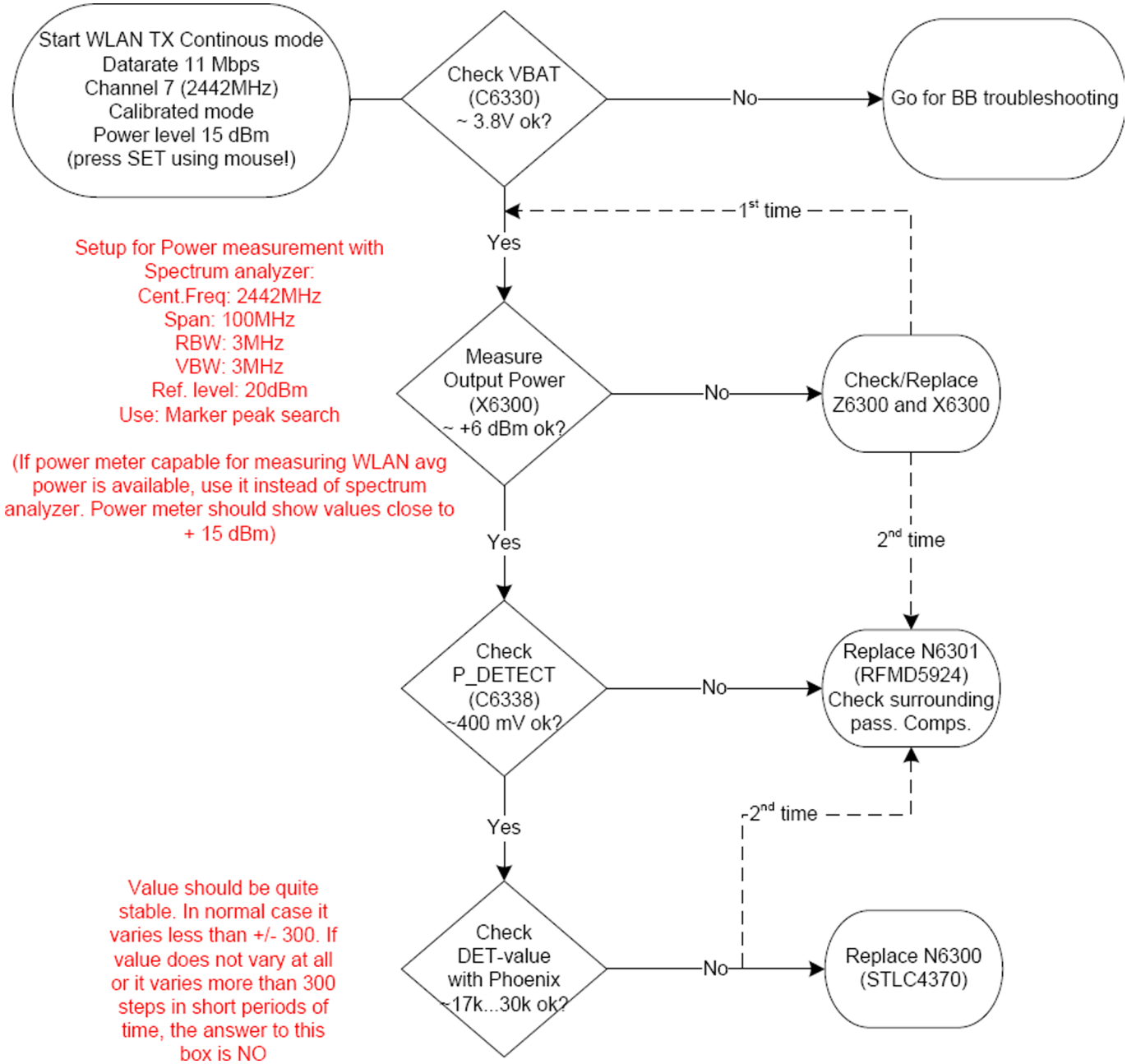
WLAN FEM troubleshooting

Troubleshooting flow



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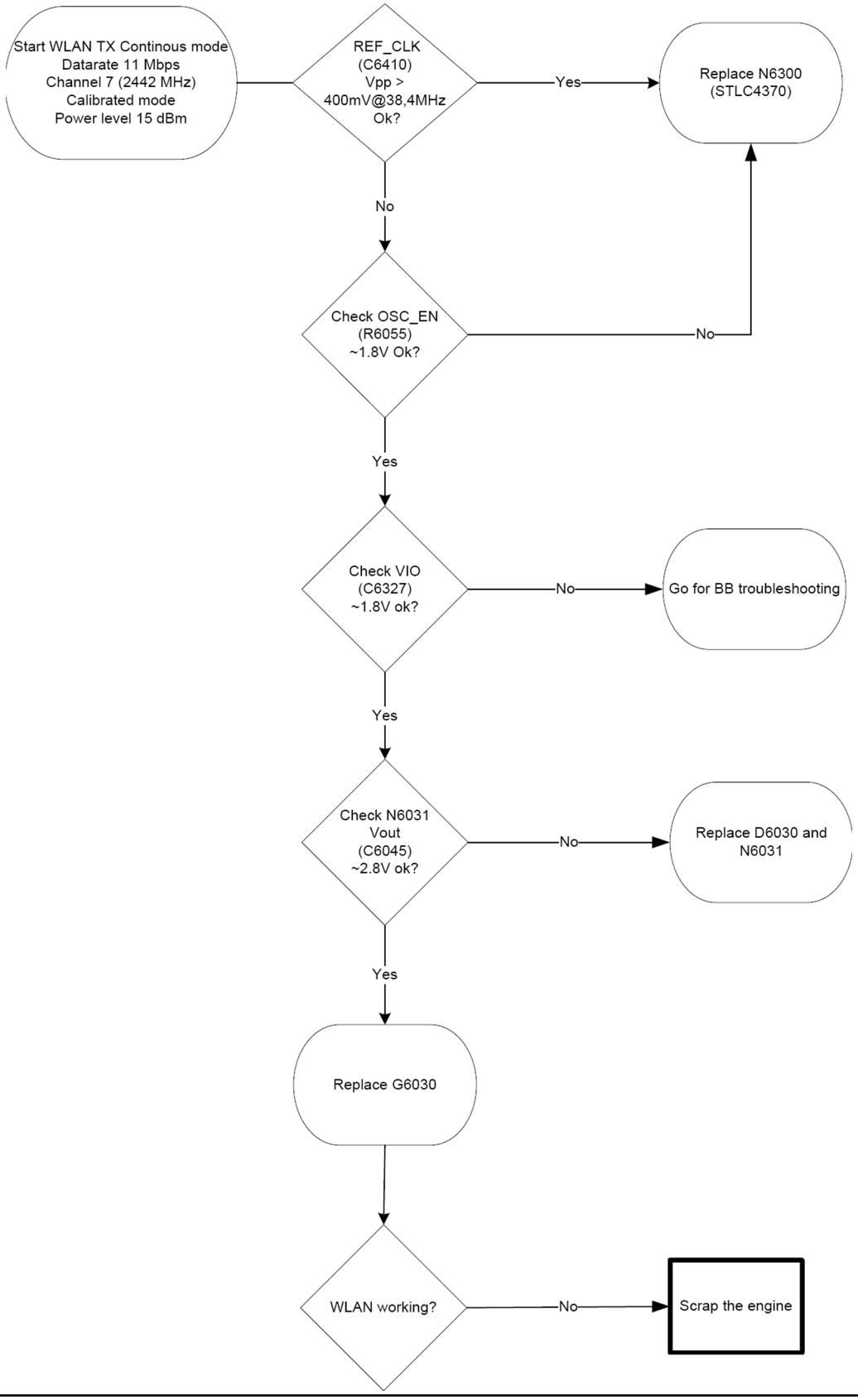
WLAN BT/TCXO troubleshooting

Troubleshooting flow



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Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

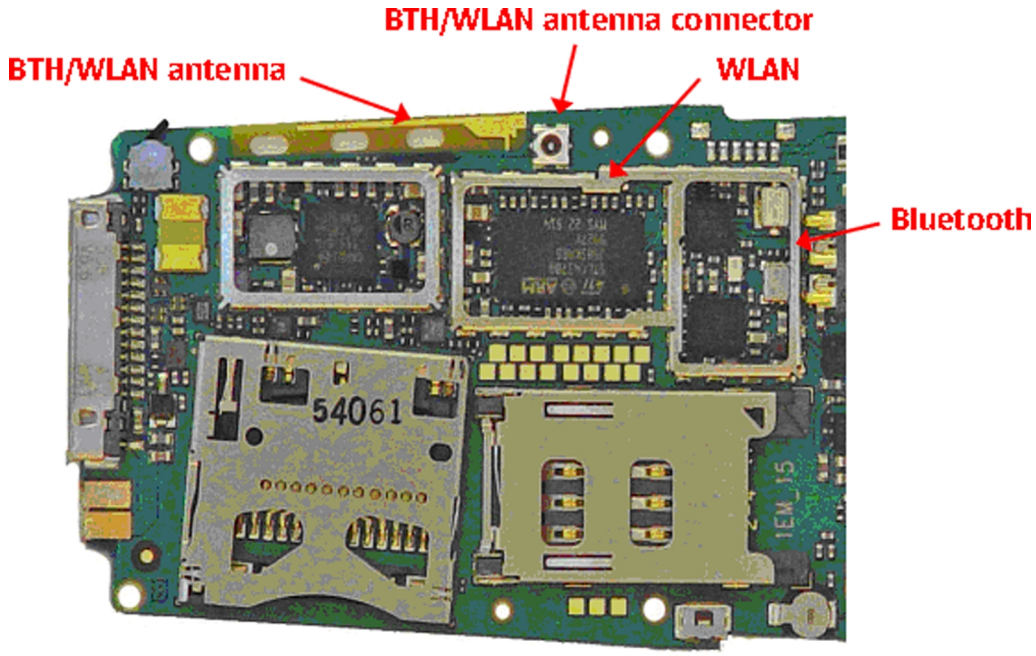
Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the BT antenna

Figure 44 Antenna element

Bluetooth/WLAN layout



Bluetooth/WLAN test points

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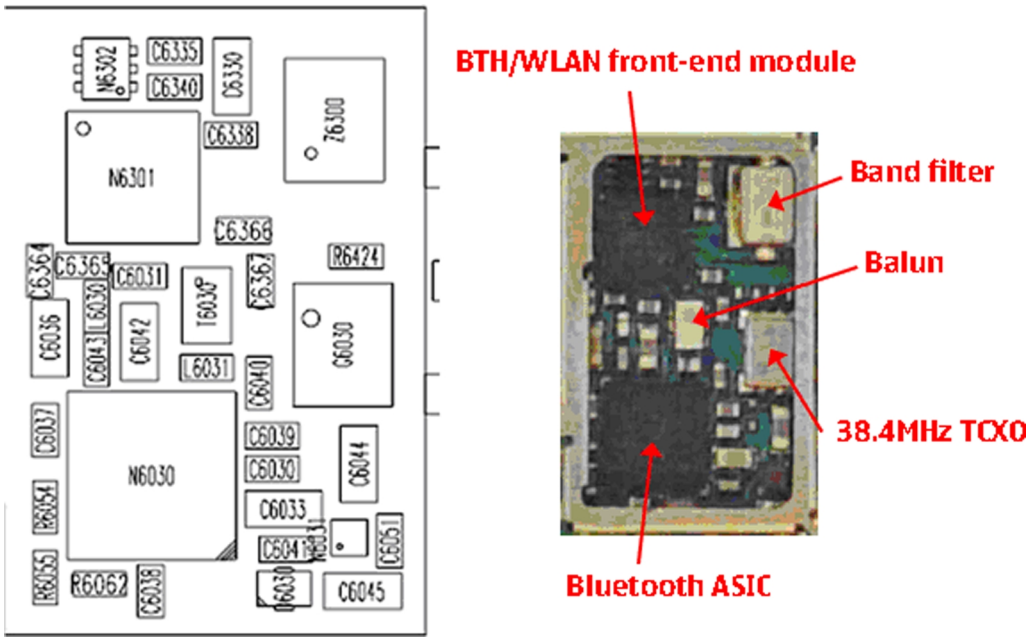

Figure 45 BT component layout

Bluetooth settings for Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.

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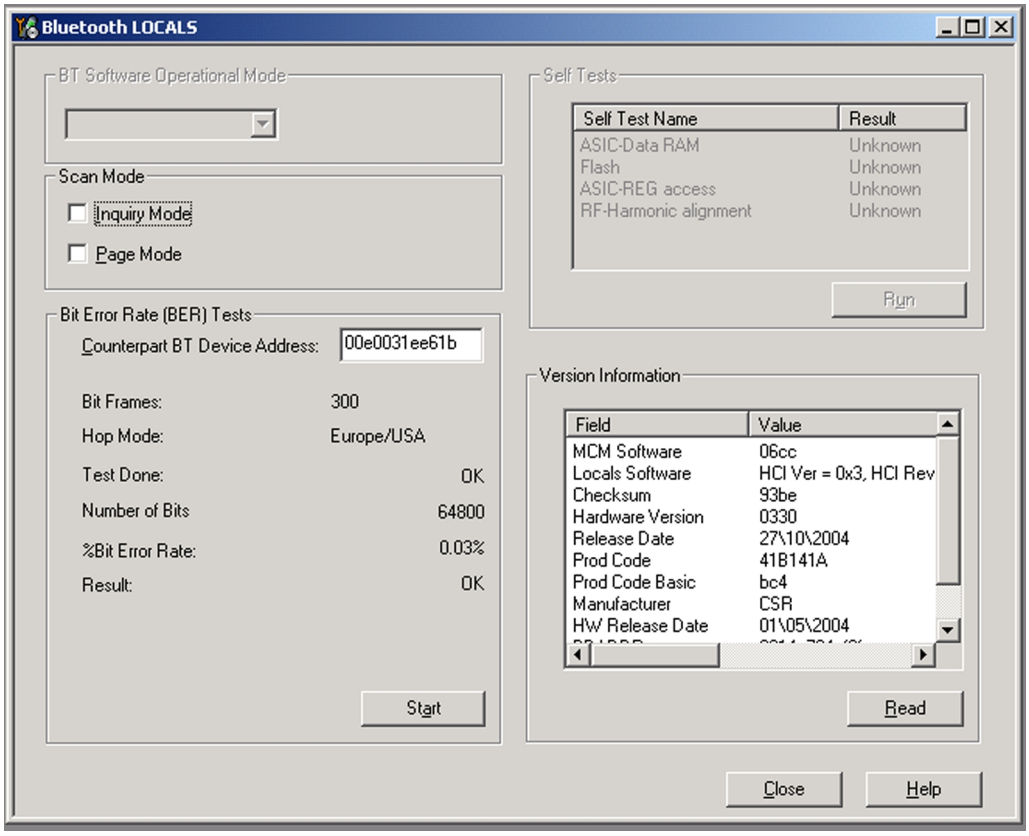

Figure 46 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
   - **ST_LPRF_IF_TEST**
   - **ST_LPRF_AUDIO_LINES_TEST**
   - **ST_BT_WAKEUP_TEST**

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7. To run the tests, click **Start**.

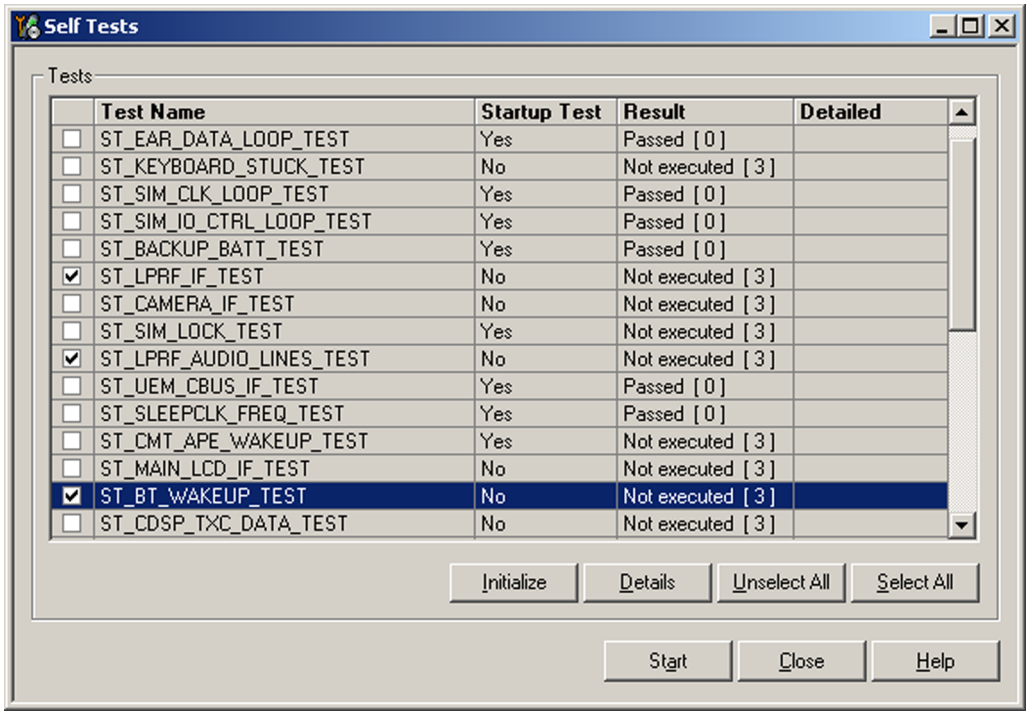

Figure 47 Bluetooth self tests in *Phoenix*

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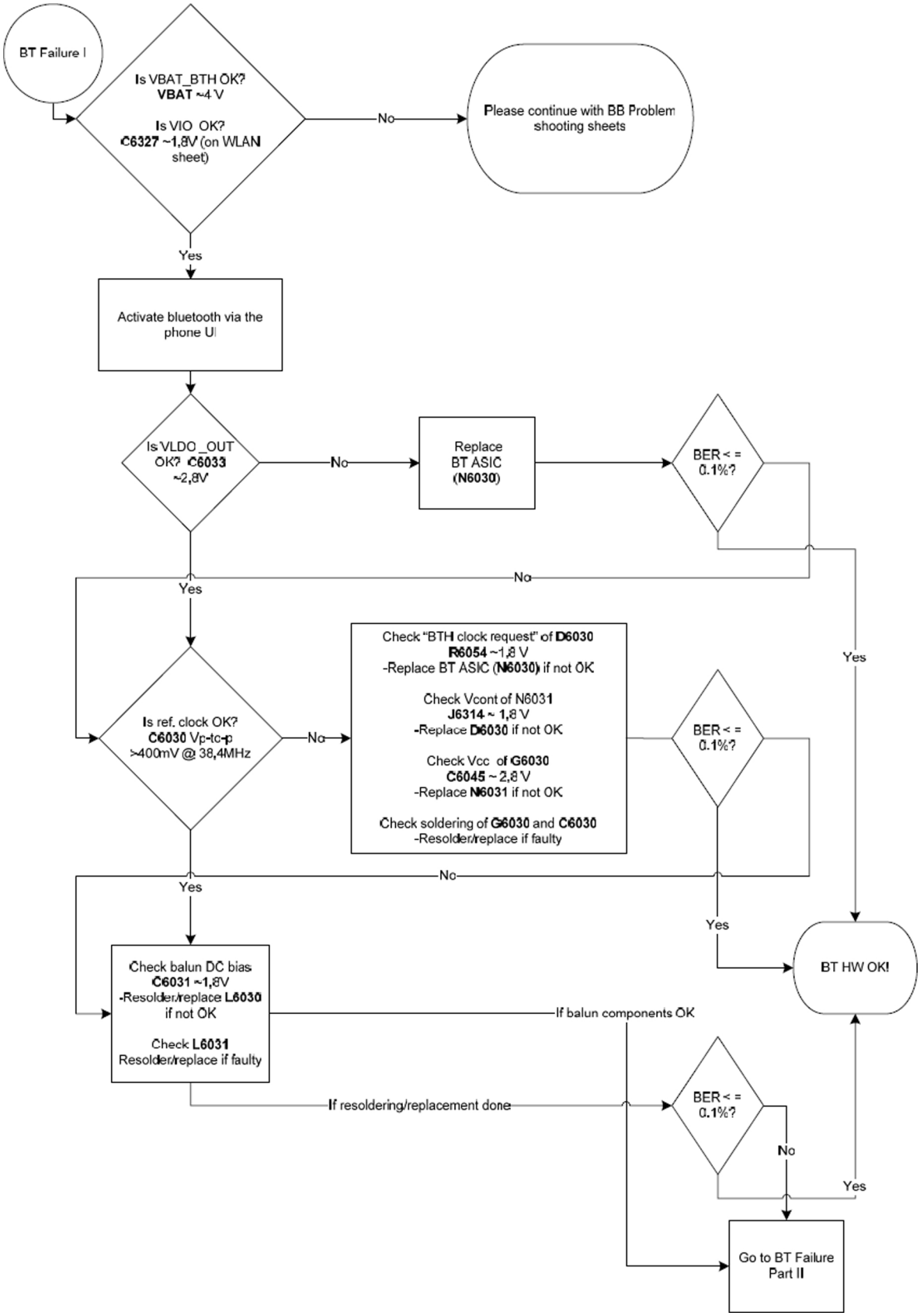
Bluetooth BER failure troubleshooting

Troubleshooting flow



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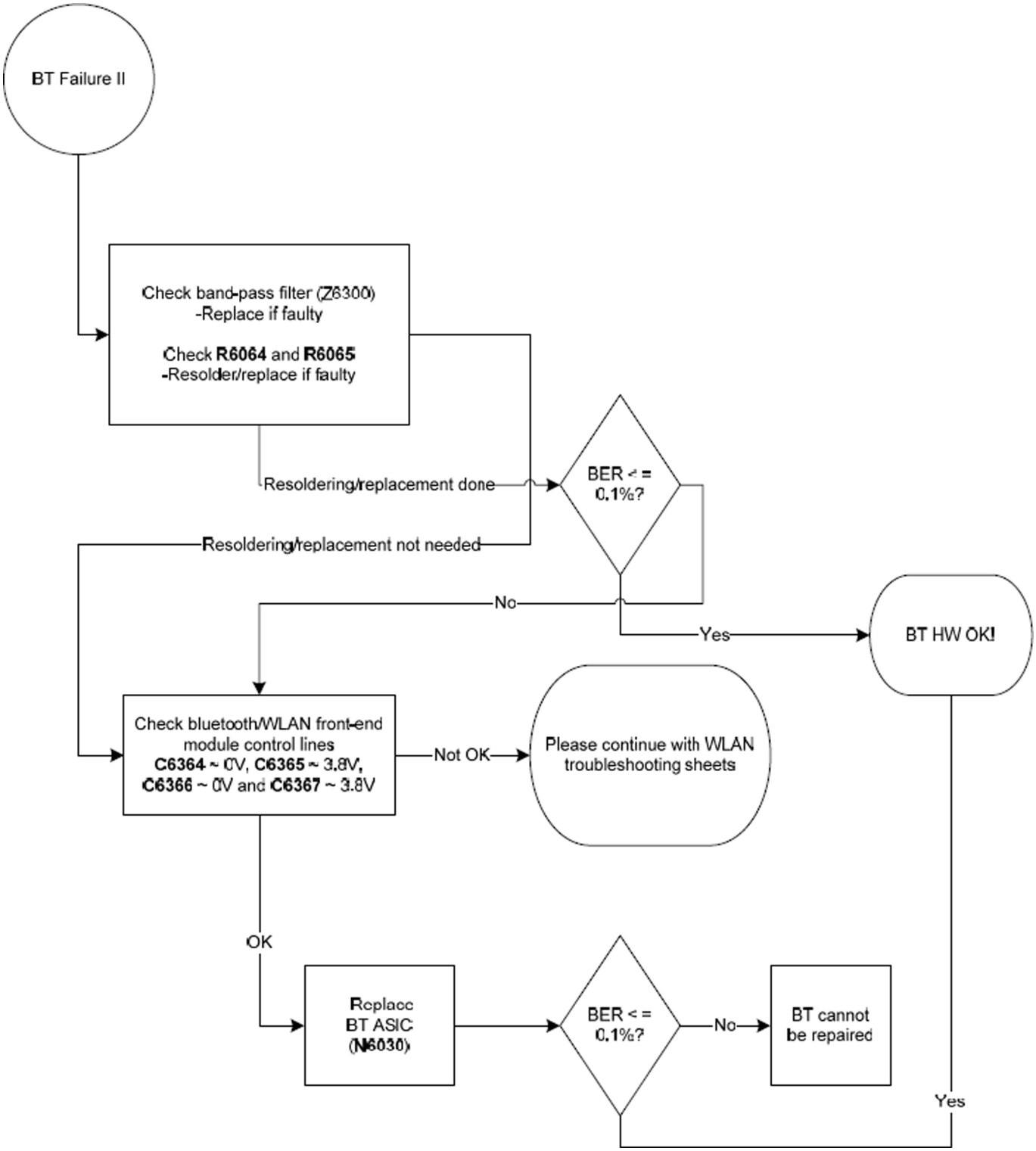

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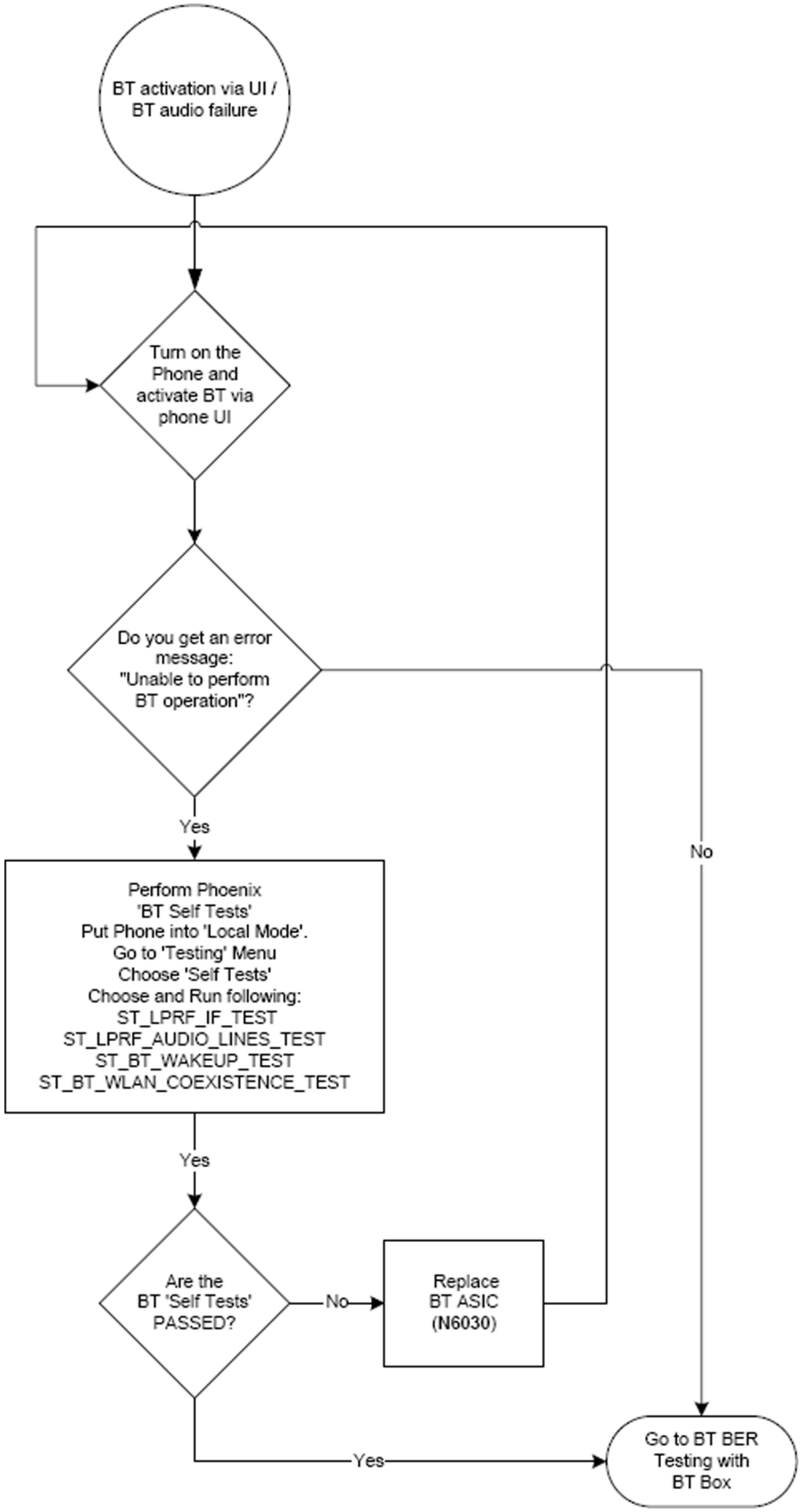
BT audio failure troubleshooting

Troubleshooting flow



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Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

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Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

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Measurement data

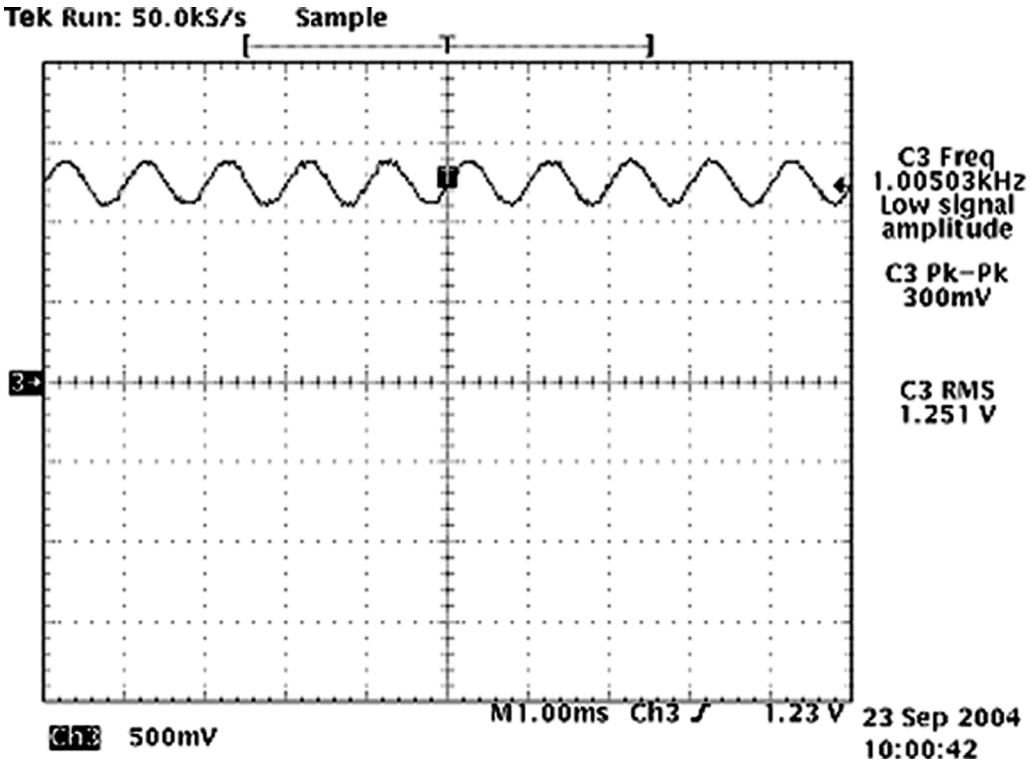
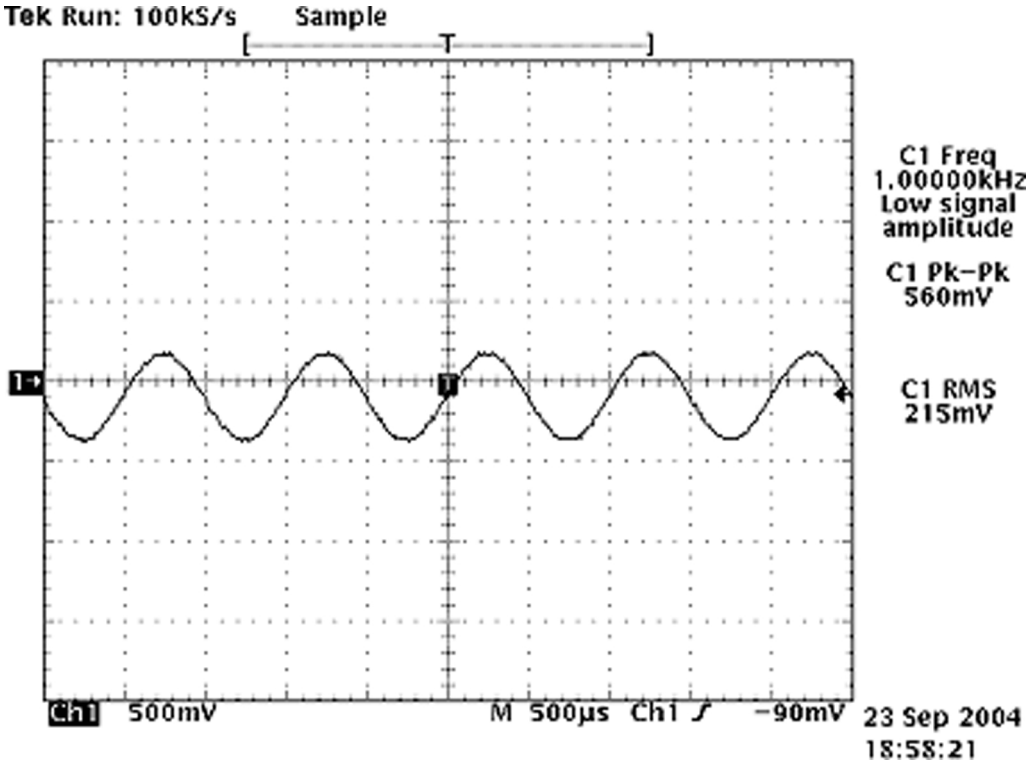


Figure 48 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 49 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

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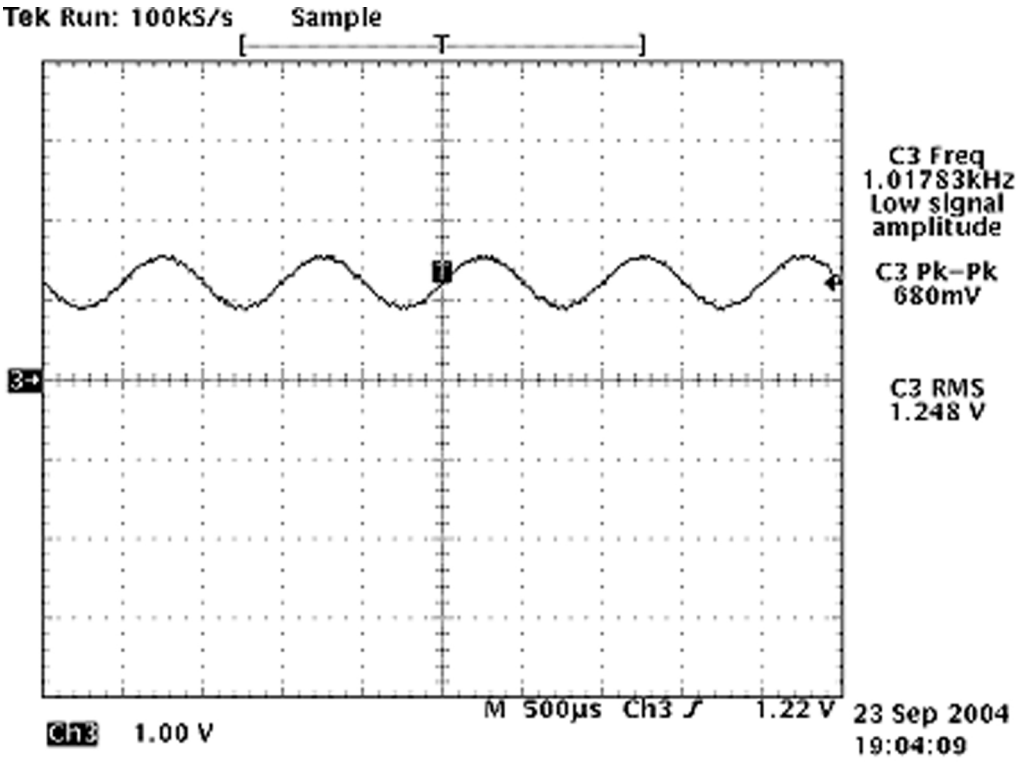

Figure 50 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

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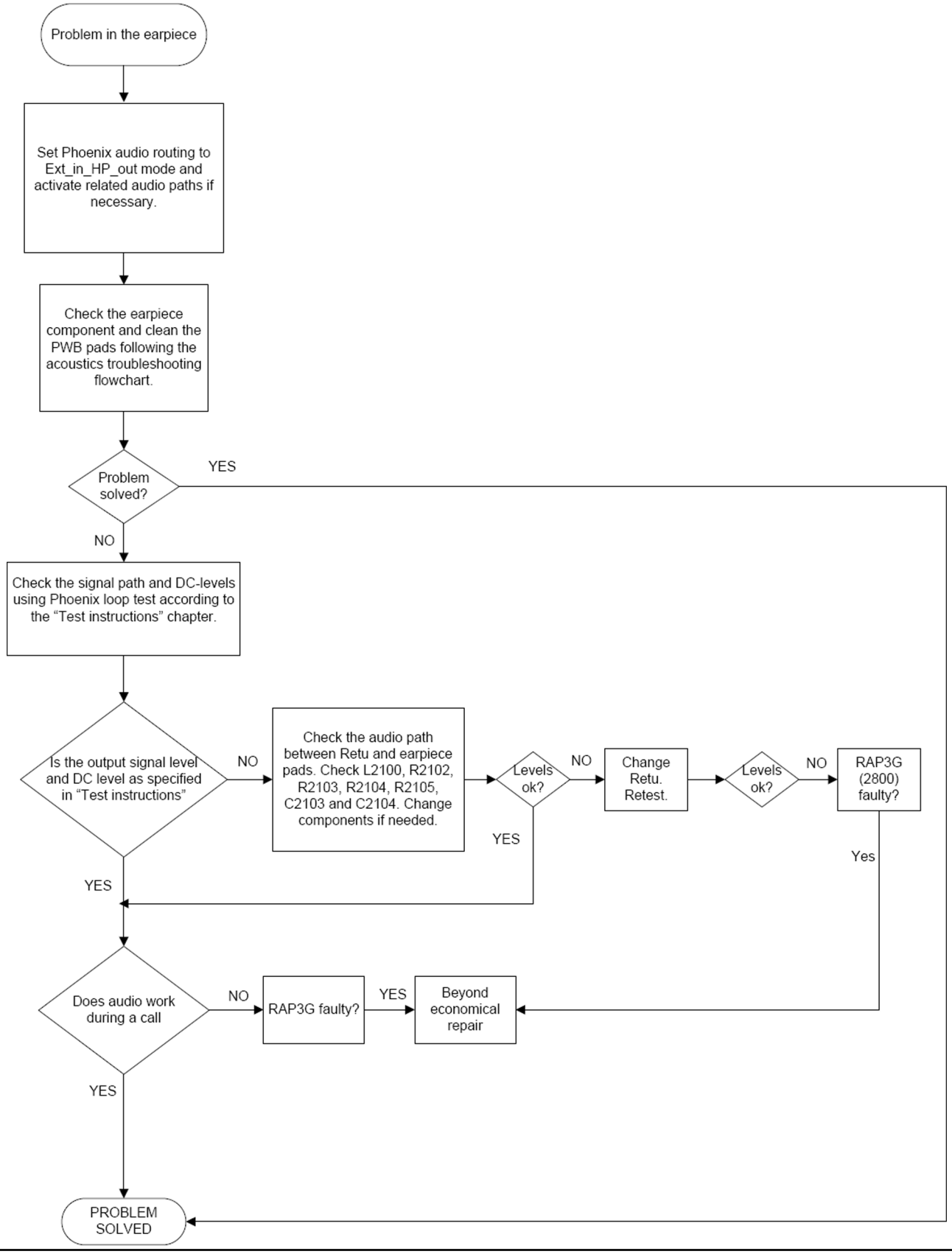
Earpiece troubleshooting

Troubleshooting flow



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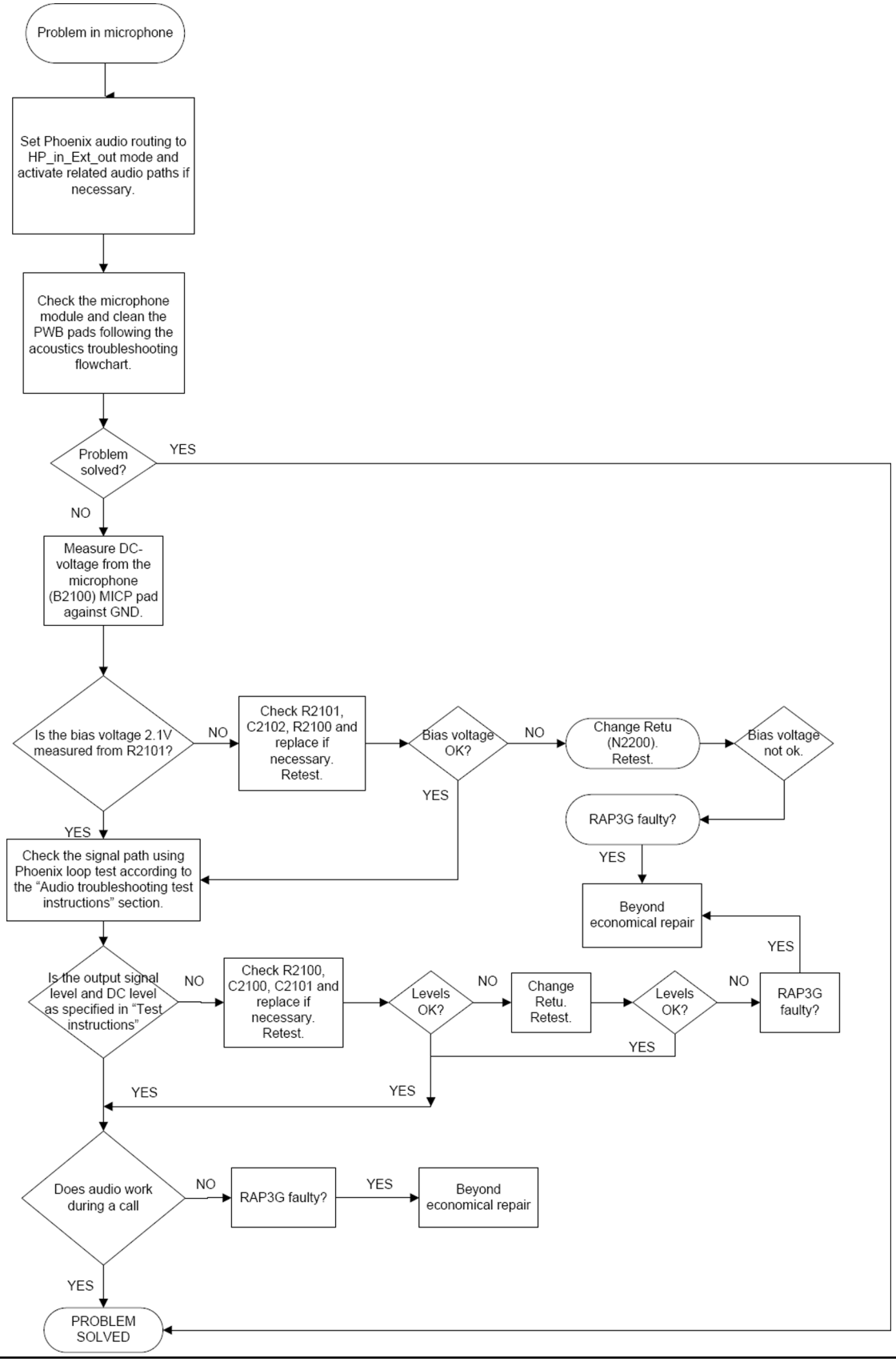
Microphone troubleshooting

Troubleshooting flow



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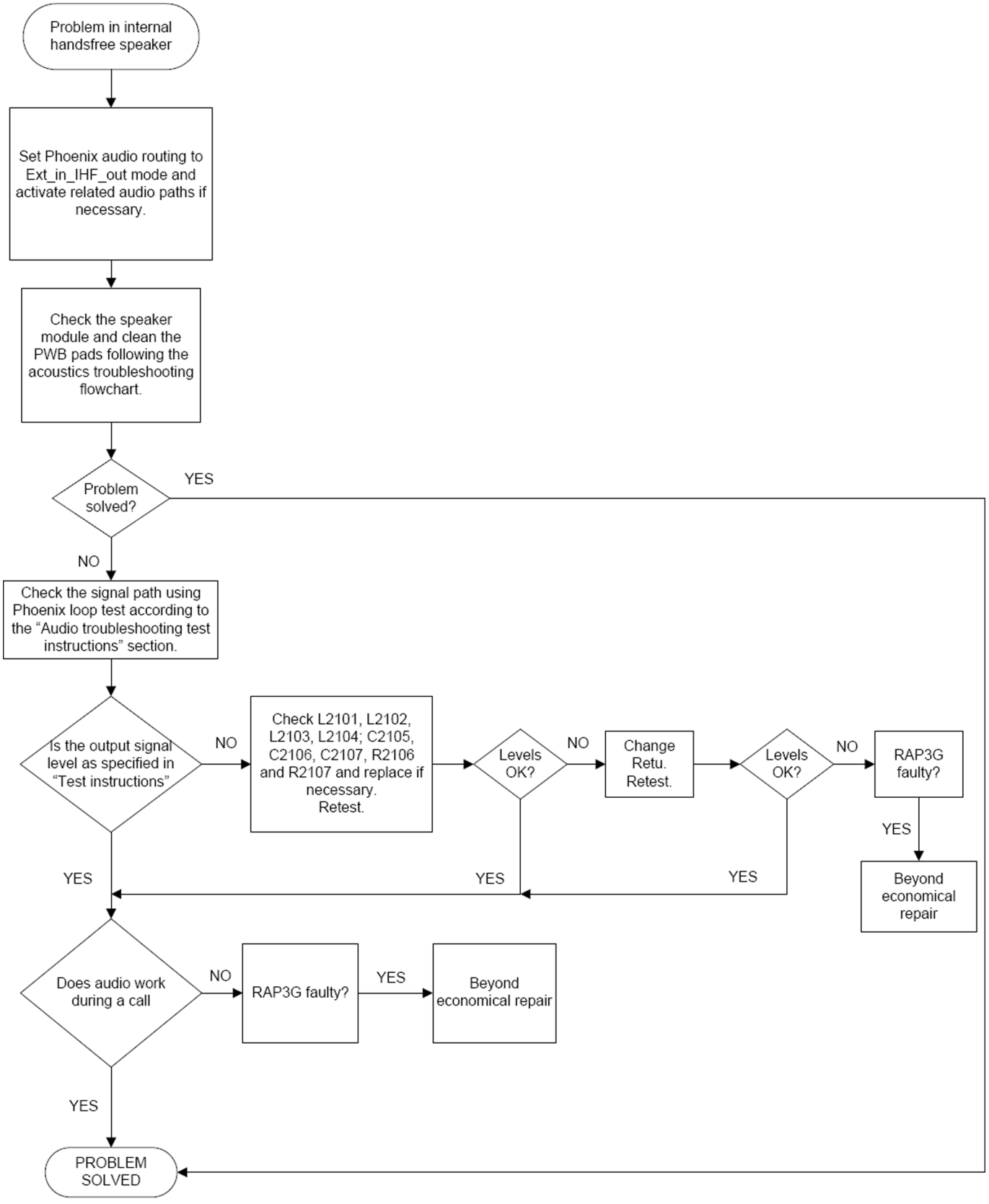
IHF troubleshooting

Troubleshooting flow



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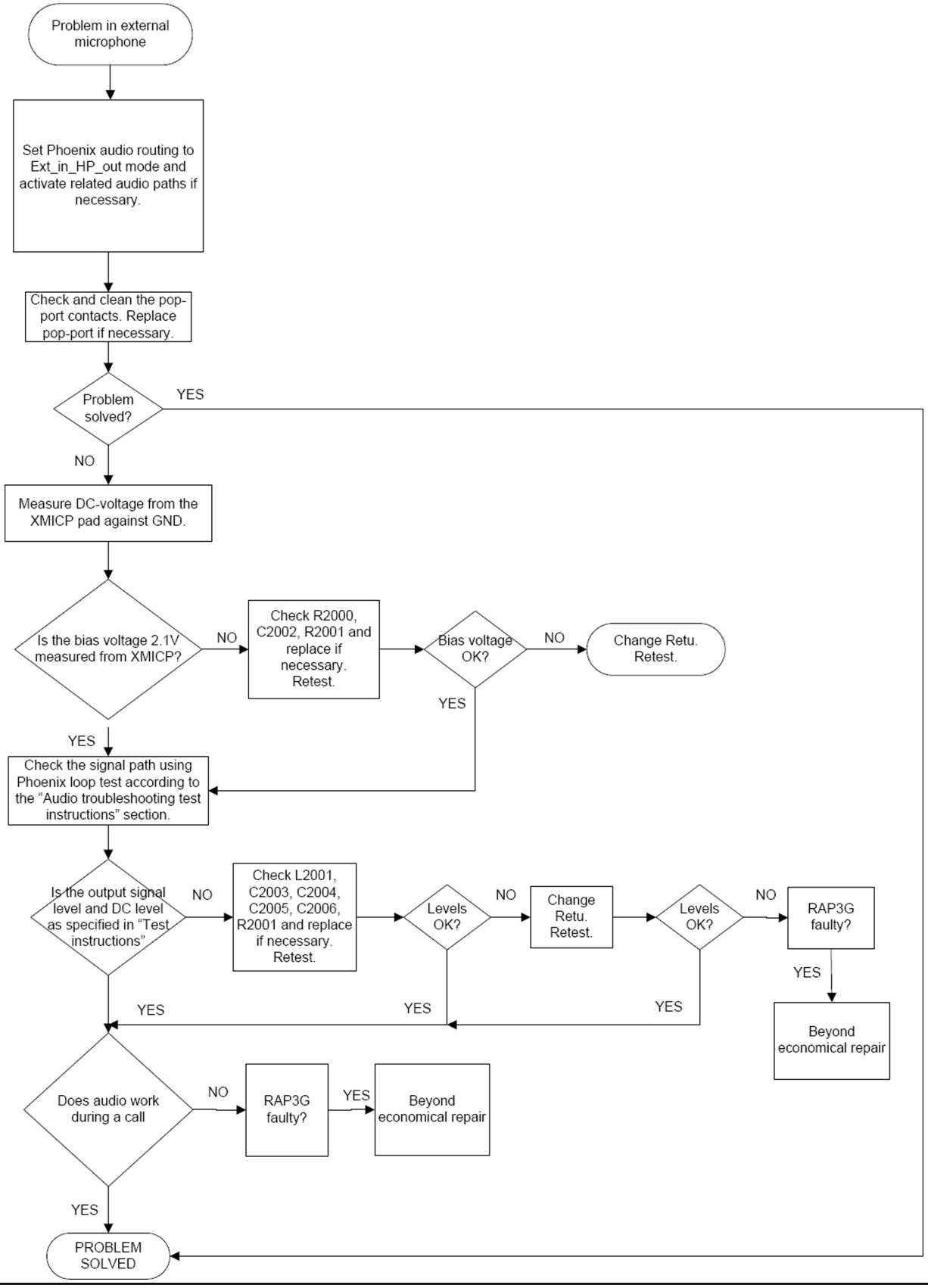
External microphone troubleshooting

Troubleshooting flow



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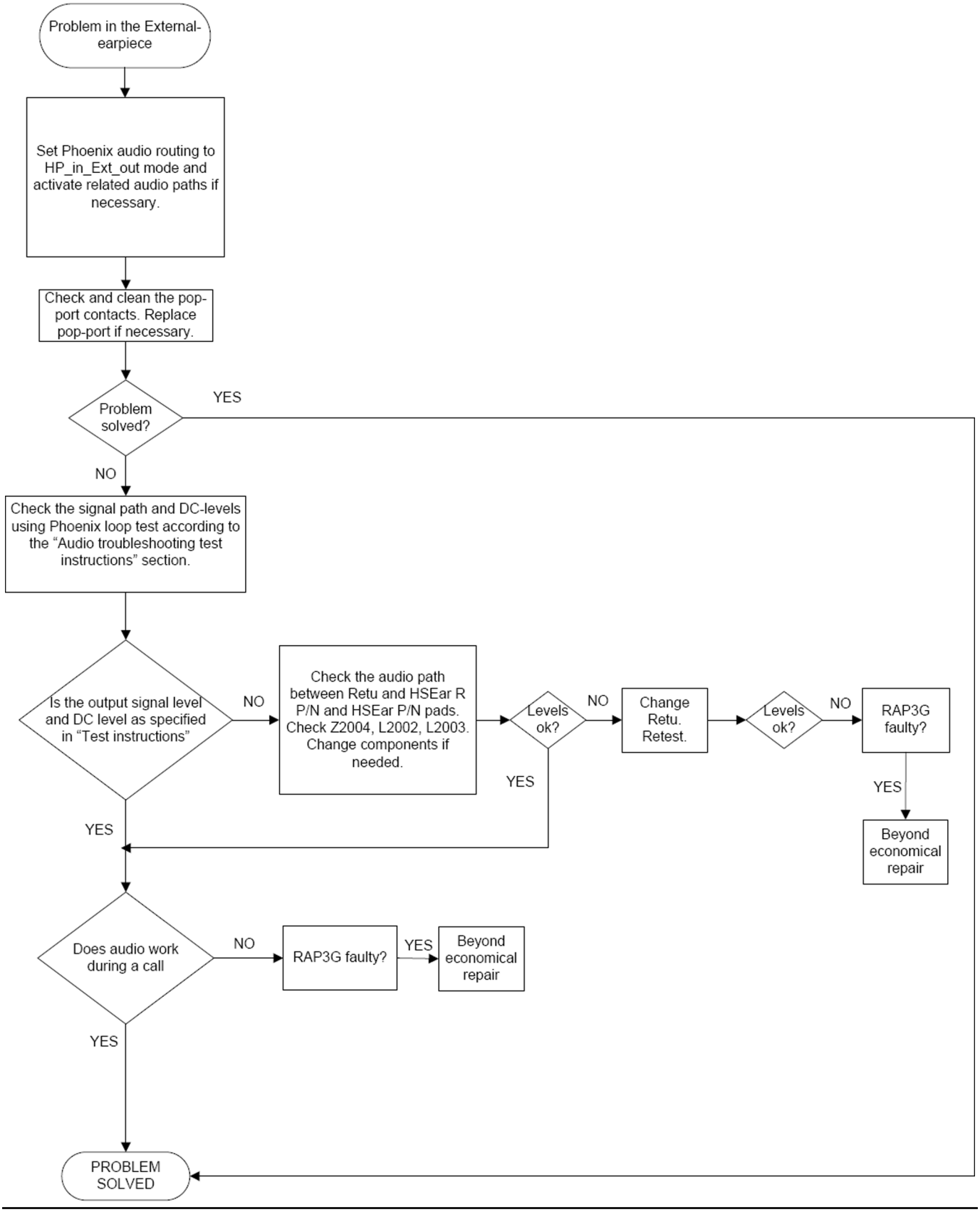
External earpiece troubleshooting

Troubleshooting flow



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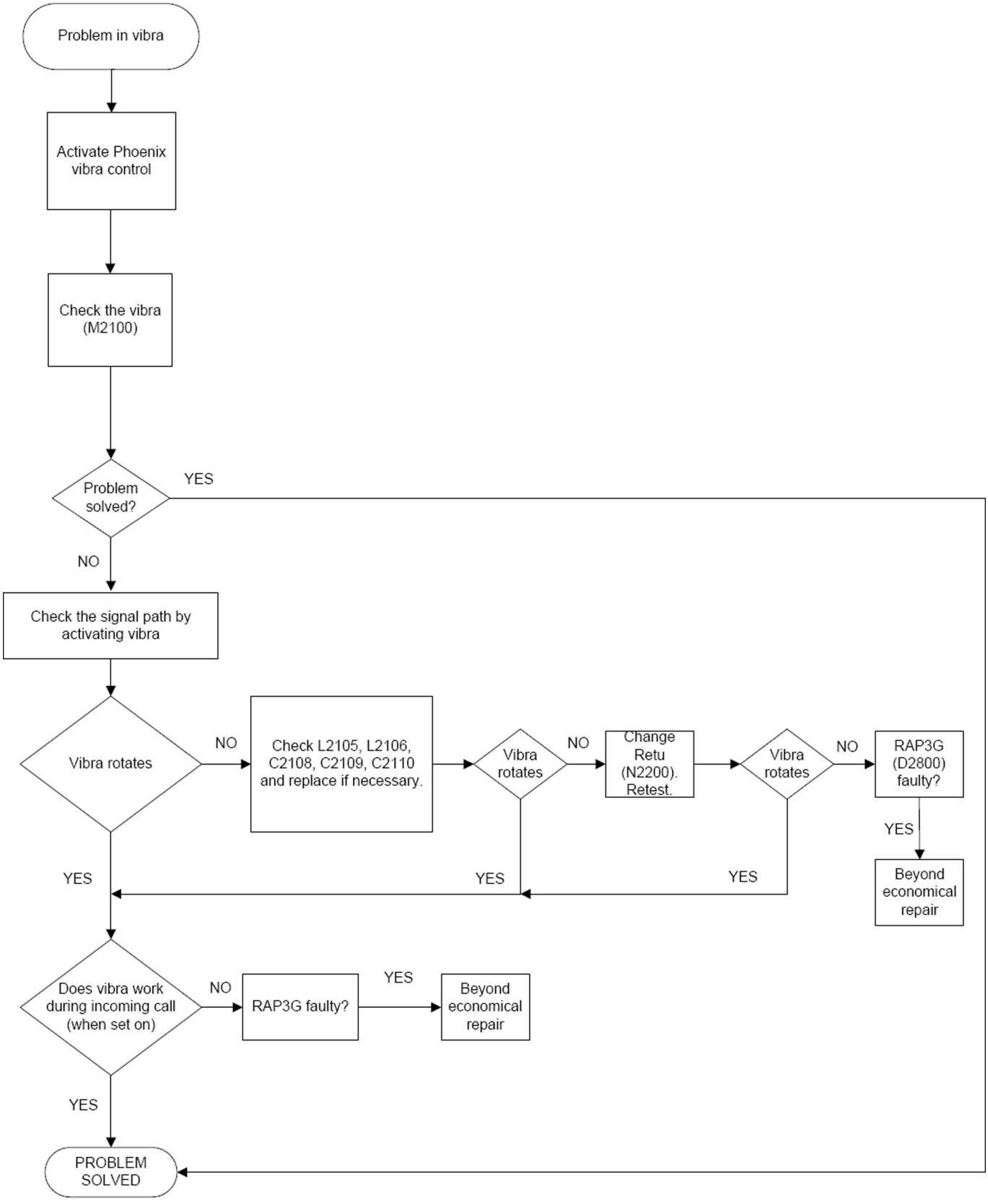
VIBRA troubleshooting

Troubleshooting flow



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Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 7 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** A mobile phone WCDMA transmitter should never be tested with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.
>
> Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around two RF ASICS: Rx ASIC and Tx ASIC. There are also two PAs (Power Amplifiers) on board, one for GSM and another for WCDMA.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB. Please note that the grounding of the PA module is directly below the PA module. Therefore, it is difficult to check or change the module.

Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

A Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware, in-circuit measurements should be evaluated carefully.

Keep in mind that all measured voltages or RF levels in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used. All spectrum analyser measurements in this manual are made with a Fluke PM9639/011 10:1 (500 ohm) probe. It is recommended that a similar kind of probe is used for all troubleshooting measurements.

When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then “GND” pads should be used for the probe ground.

For additional RF troubleshooting instructions, see Appendix A. These instructions include descriptions/ instructions for RF self-tests as well as troubleshooting instructions for various fault cases.

RF key component placement

The RF section of the phone is build around two RF ASICs, Rx ASIC N7500 and Tx ASIC N7501.

There are also two PAs on the board, one for GSM (N7502) and one for WCDMA (N7503). The WCDMA PA needs variable supply voltage to work power efficiently and therefore there is a Switched Mode Power Supply (SMPS) component (N7504) added to the PWB.

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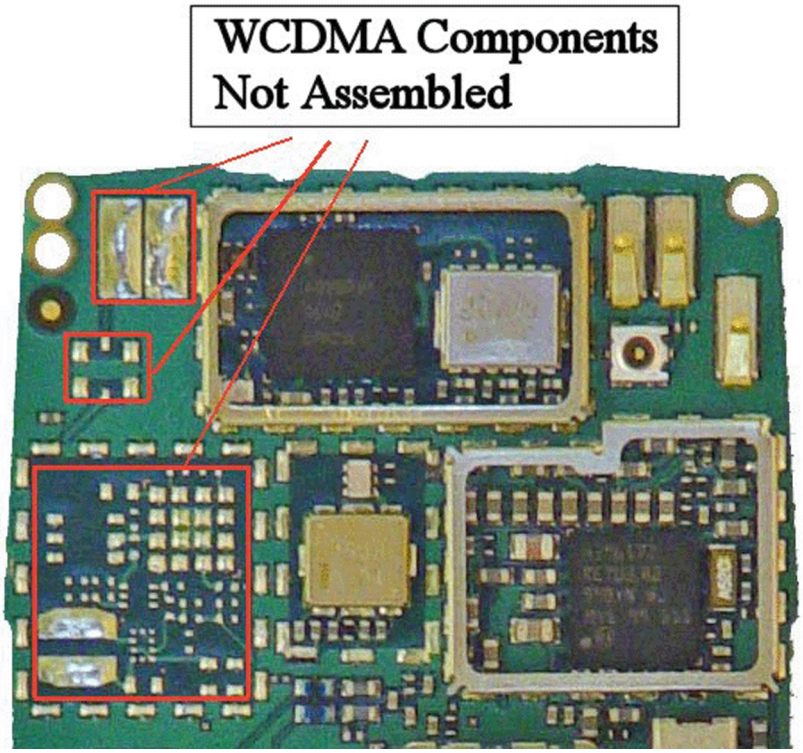

Figure 51 RM-24 bottom differences in key component placement

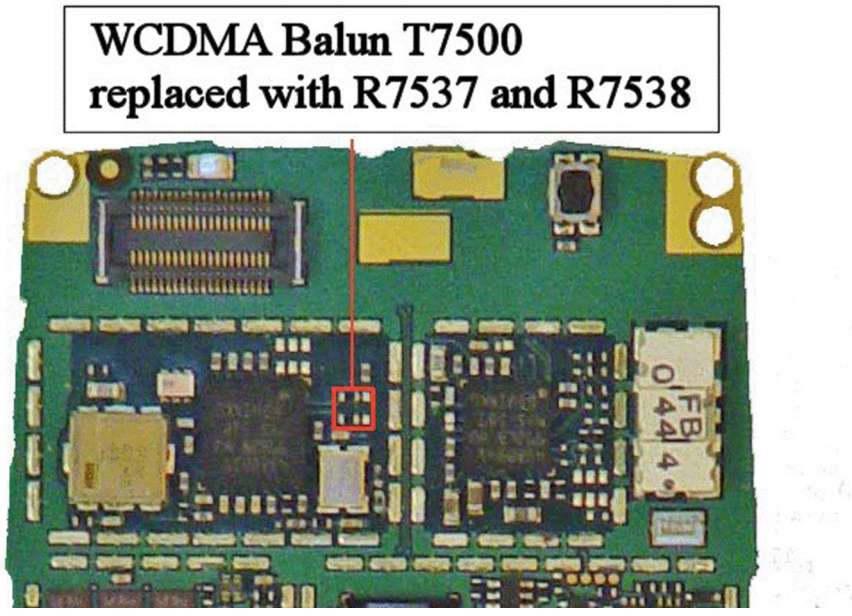

Figure 52 RM-24 top diffecences in key component placement

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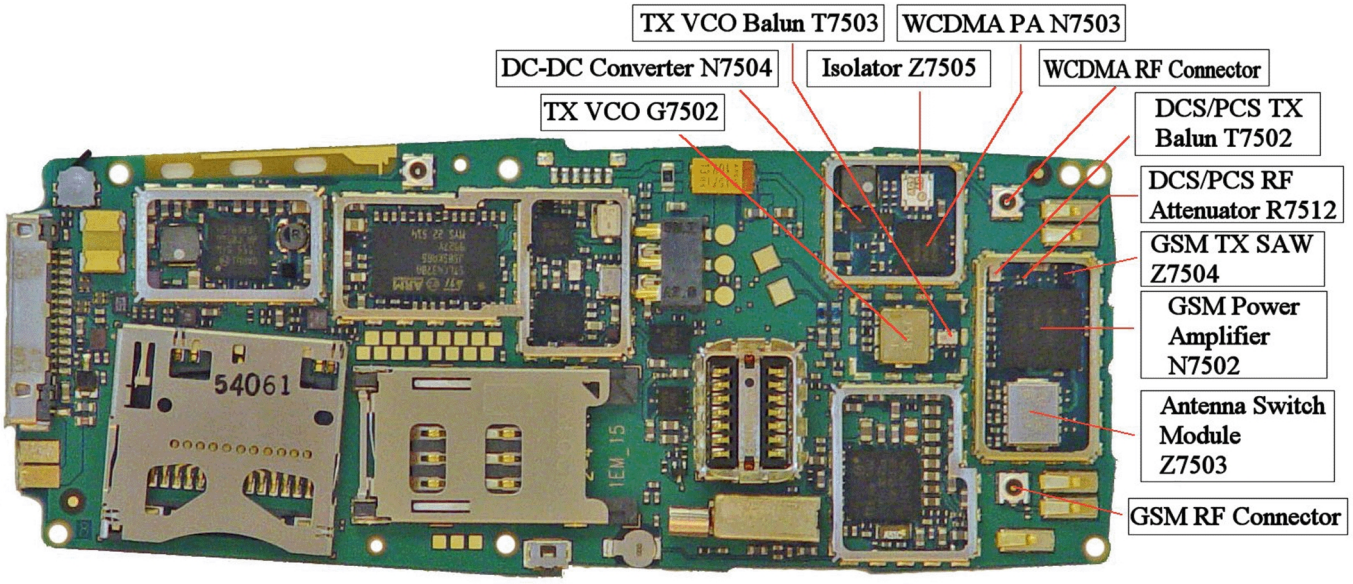

Figure 53 RM-10 bottom key component placement

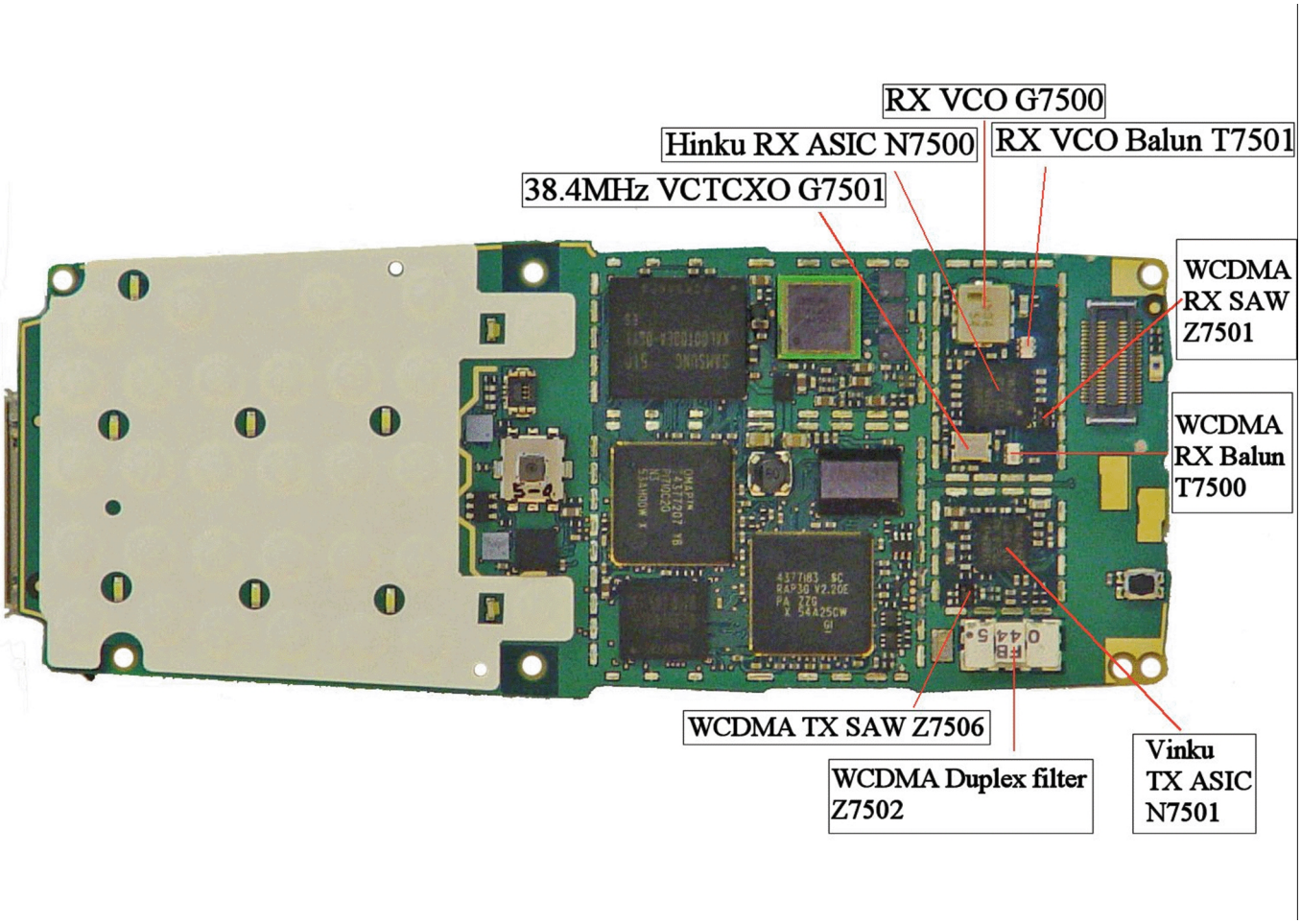

Figure 54 RM-10 top key component placement

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Troubleshooting test point locations

Test points for spectrum analyser

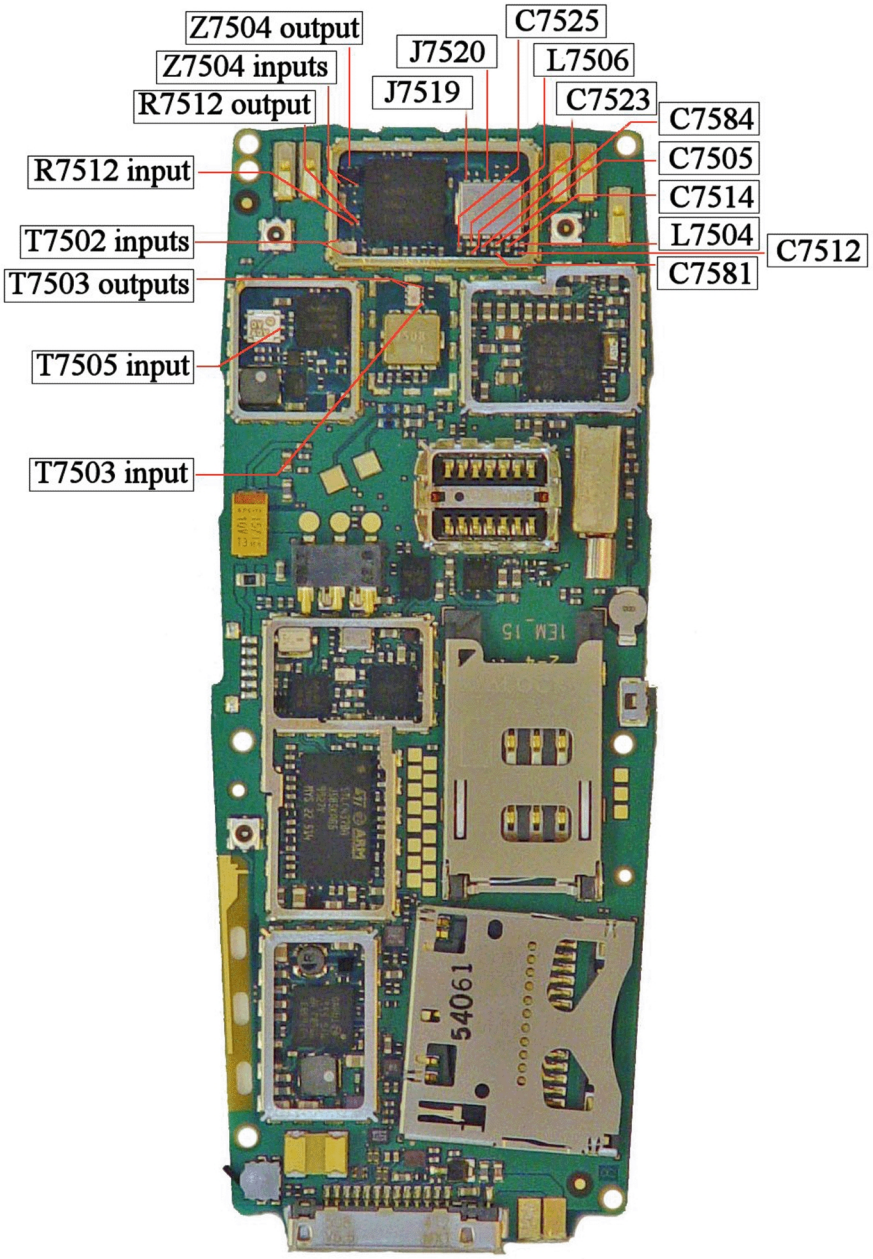

Figure 55 Test point locations for spectrum analyser - bottom

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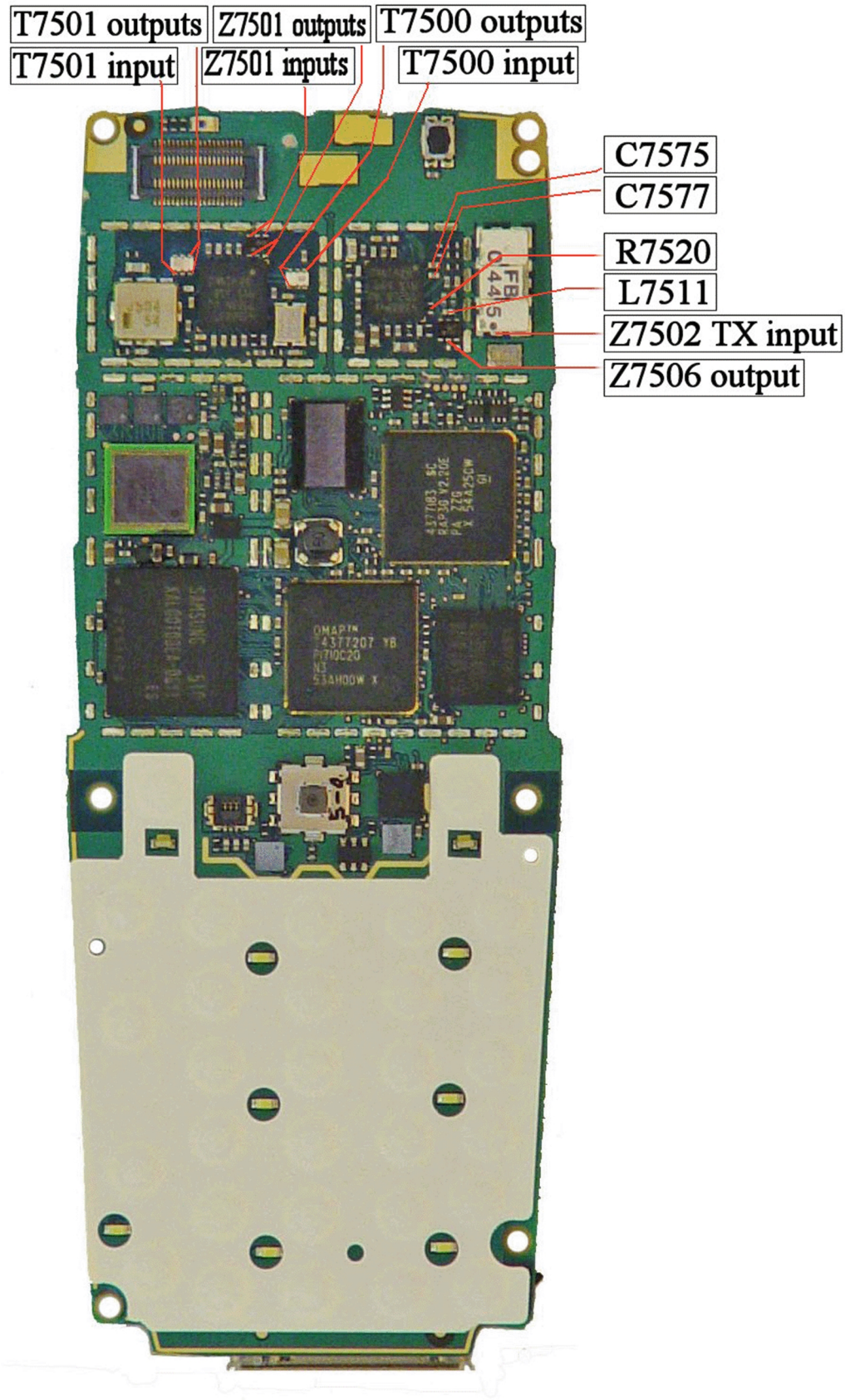

Figure 56 Test point locations for spectrum analyser - top

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Test points for oscilloscope

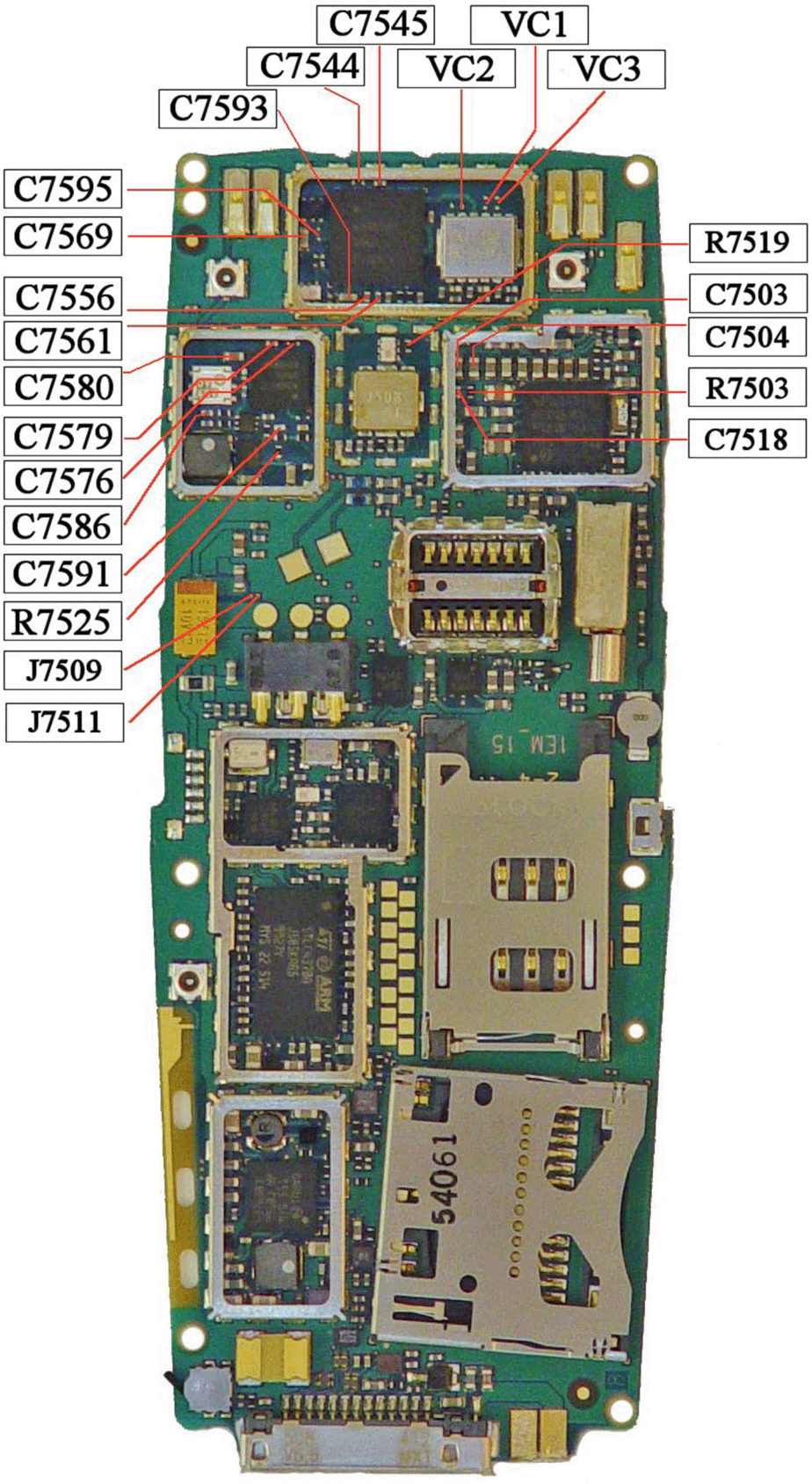

Figure 57 Test points for oscilloscope - bottom

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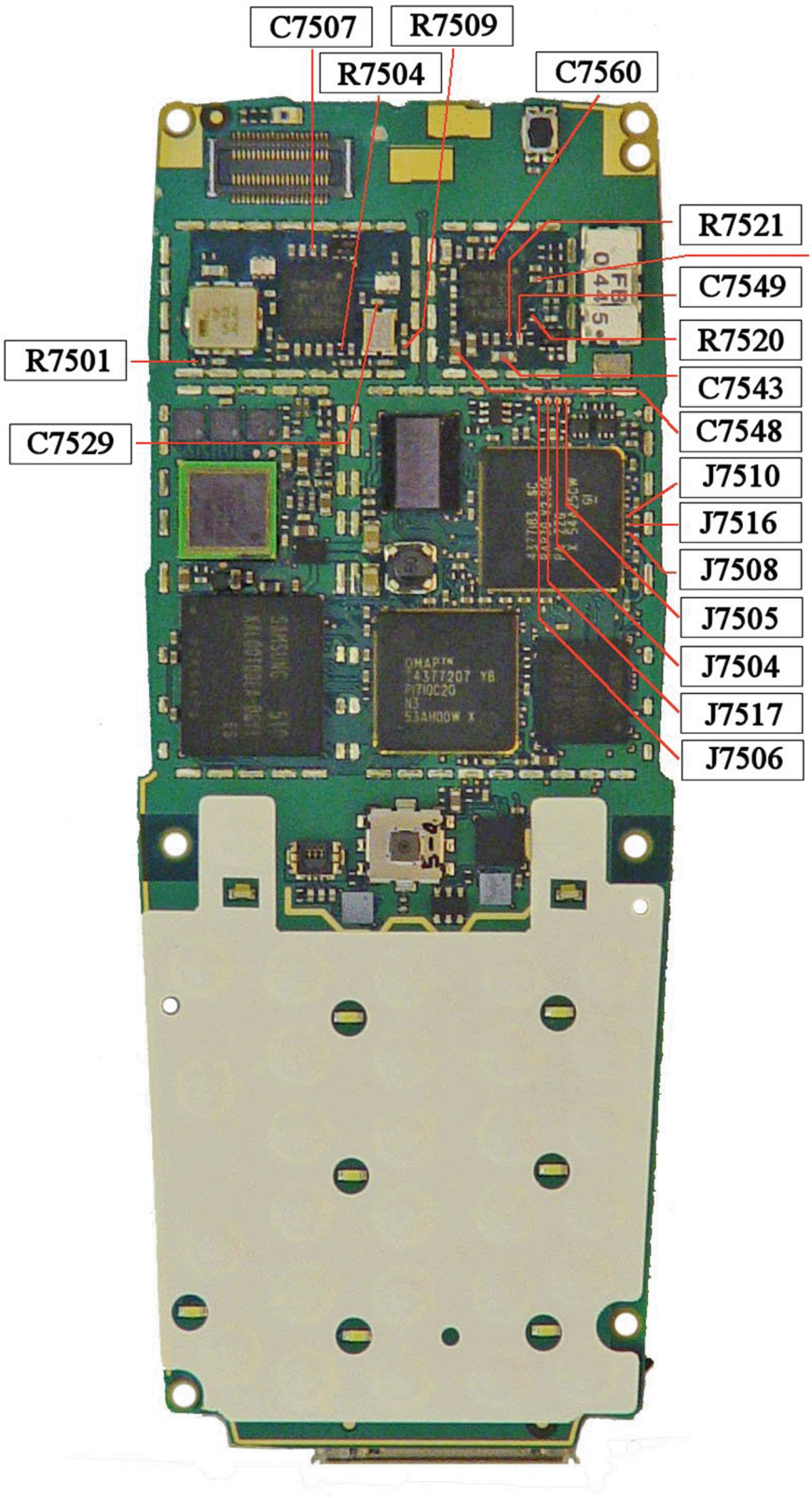

Figure 58 Test points for oscilloscope - top

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Receiver troubleshooting

Introduction to Rx troubleshooting

Rx can be tested by making a phone call or in the local mode. For the local mode testing, use Phoenix service software.

The primary Rx troubleshooting parameter RSSI (Receiving Signal Strength Indicator). For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page 7–12), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page 7–14).

In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal, which is 67.771 kHz above the carrier frequency.

In WCDMA, the input signal can be either a real WCDMA signal or a CW signal, which is 1 MHz above the carrier frequency.

For service tool usage instructions, refer to section **Service Tools and Service Concepts**.

Related information

- WCDMA Rx chain activation for manual measurement (page 7–13)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –80 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.

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4. In the *RSSI Reading* window, select the appropriate band and channel.

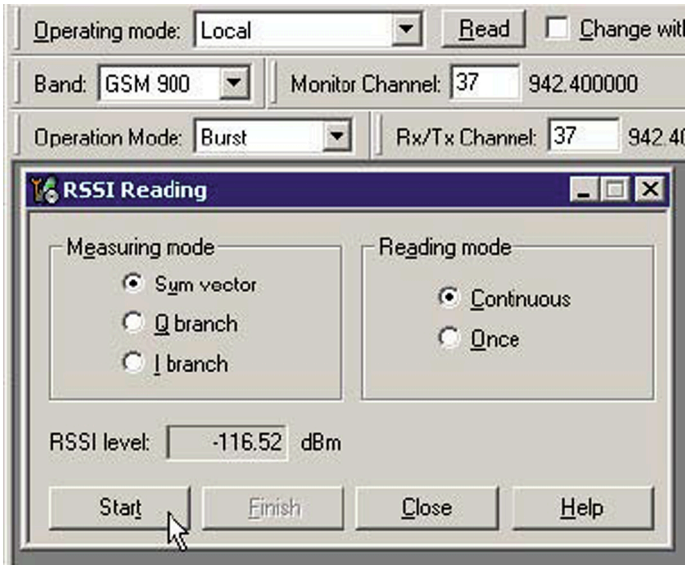

Figure 59 *RSSI Reading* window

5. To start the measurement, activate GSM Rx chain, click **Start**.

Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-80 dBm).

WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Control** .
3. In the *Rx Control* window:

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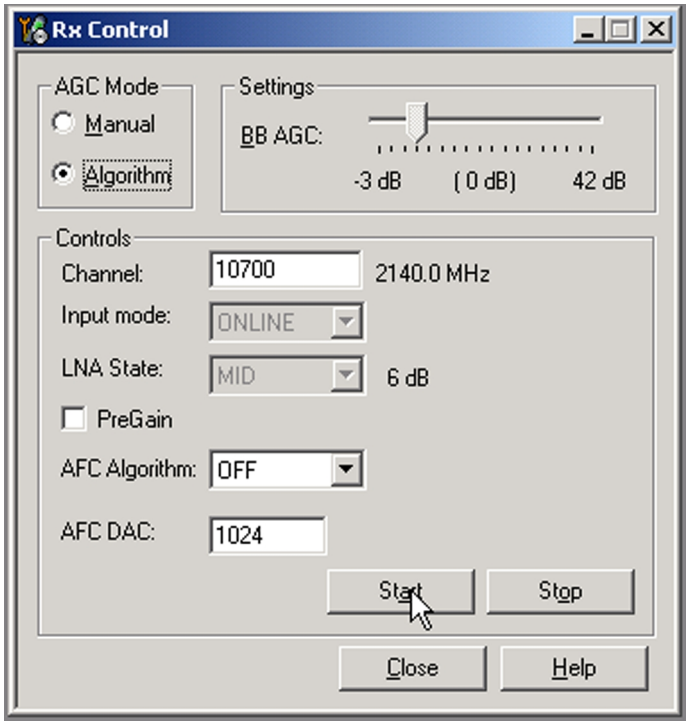

Figure 60 *Rx Control* window

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next actions

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

Note: Clicking **Stop** also disables **Tx Control** if that was active!

WCDMA RSSI measurement

Prerequisites

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–13).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .
3. In the *Rx Power Measurement* window, choose the following settings:
   - Mode: RSSI
   - Continuous Mode

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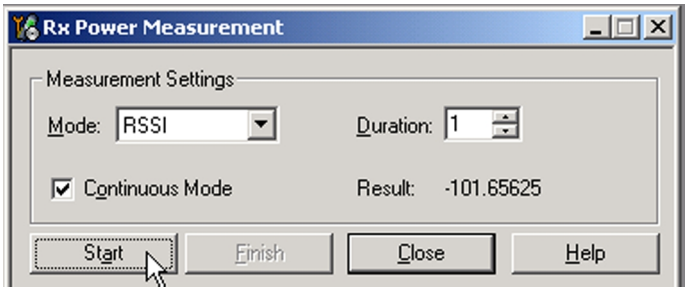

4. To perform the measurement, click **Start**.

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls"; in WCDMA transmitter testing the best tool is "Tx Control".
- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the GSM800/EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a test jig to a computer with a DAU-9S cable or to a FPS-8 flash prommer with a modular cable.

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a product-specific module jig.

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.

   Set the DC supply voltage to 3.9 V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.
3. Connect an RF cable between the RF connector of the product-specific module test jig and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM or WCDMA PA may be damaged.

   > **Note:** There are three antenna connectors in the module jig:
   >
   > - one for GSM
   > - one for WCDMA
   > - one for Bluetooth
   >
   > Make sure that all connections are made to the correct RF connector.

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Normally a spectrum analyser is used as measurement equipment.

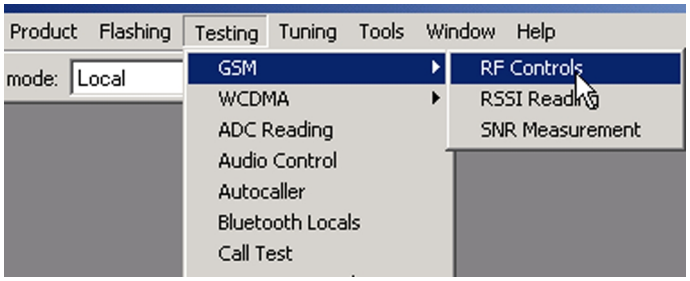
Note: The maximum input power of a spectrum analyser is +30 dBm.

To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

4. Set Tx on.
   i Set the phone module to the test jig and start *Phoenix service software*.
   ii Initialize connection to the phone. (With FPS-8 use FBUS driver when using DAU-9S and COMBOX driver).
   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).
   iv From the toolbar, set Operating mode to “Local”.

Alternative steps

- GSM850/EGSM900/GSM1800/GSM1900 troubleshooting
  i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .



  ii In the *RF Controls* window:
  - Select band "GSM850" or “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM900”).
  - Set Active unit to “Tx” (Default = “Rx”).
  - Set Operation mode to “Burst” (Default = “Burst”).
  - Set Tx data type to “All1” (Default = “All1”).
  - Set Rx/Tx channel to 190 on GSM850 or 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
  - Set Edge to “Off” (Default).
  - Set Tx PA mode to “Free” (Default).
  - Set power level to 5 (Default = 19) on GSM850/GSM900 or to 0 (Default = 15) on GSM1800/GSM1900.

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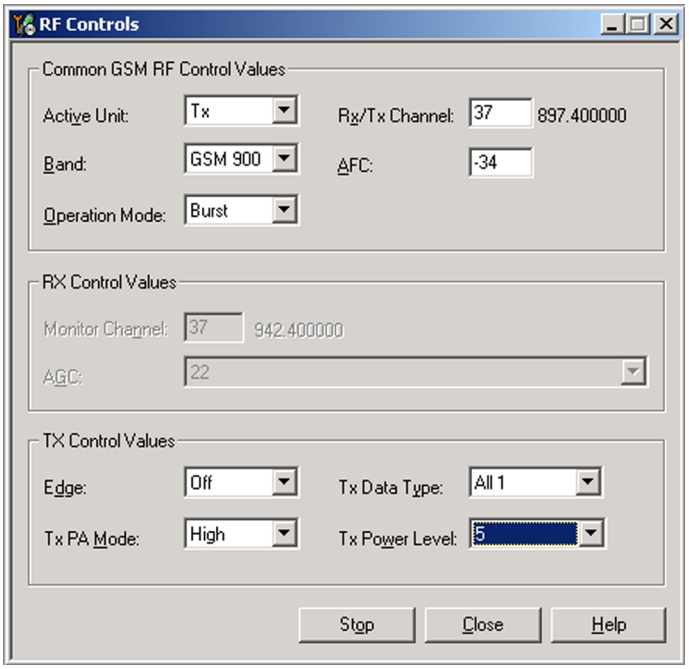
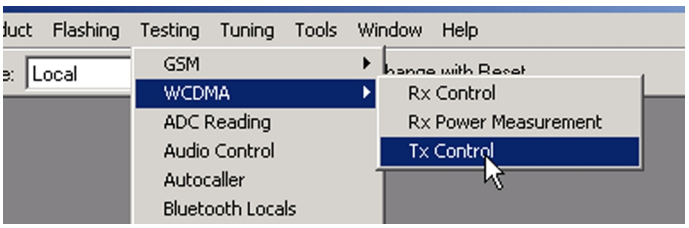


Figure 61 RF Controls window

- WCDMA troubleshooting

  i From the Testing menu, activate the *Tx Control* window:**Testing -> WCDMA -> Tx Control** .



  ii In the *Tx Control* window:
  - Select the *Algorithm mode* tab.
  - Set Start level to “0” dBm (Default = “0”).
  - Set Step size, Step count and Sequence to “0” (Default = “0”).
  - Set Scrambling code class to “LONG” (Default = “LONG”).
  - Set Scrambling code to “16” (Default = “16”).
  - Set DPDCH Code number to “0”, Code class to “2” and Weight to “15” (Defaults).
  - Set DPCCH Code number to “0”, Code class to "2" and Weight to “8” (Defaults).
  - Set Channel to 9750.
  - Check the "DPDCH enabled" checkbox (Default).

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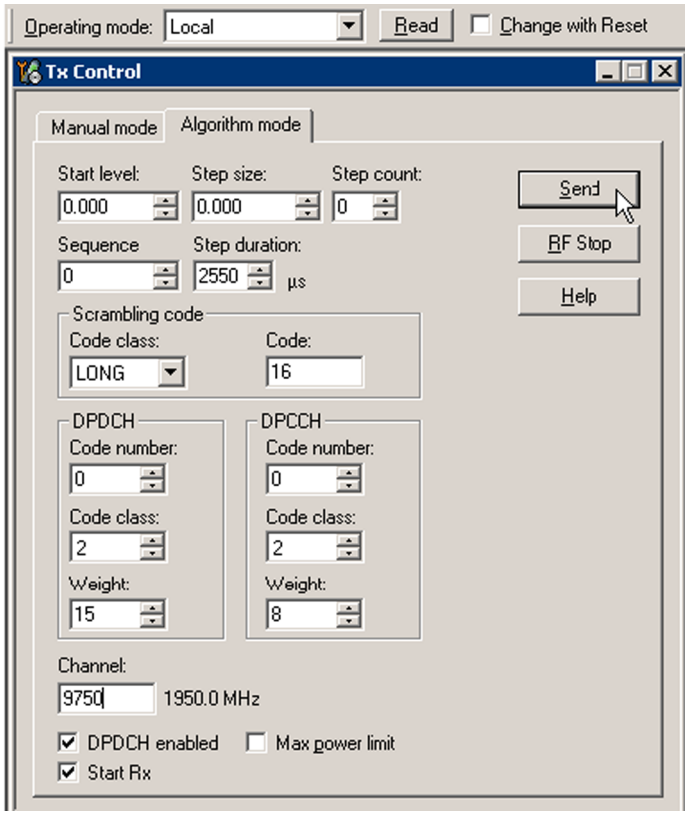

Figure 62 Tx Control window

Next actions

When settings are done, click “Send” to enable them.

If you change the settings (e.g. give a new channel number), you need to click “Stop” and “Send” again.

Checking antenna functionality

The main antenna has two separate antenna elements: GSM and WCDMA.

In the GSM antenna, there is one Feed and two GND contacts.

In the WCDMA antenna, there is one Feed and one GND contact.

The contacts of the GSM antenna are separated in the (RDC = 0 ohm) short-circuit. The contacts of the WCDMA antenna are in the (RDC = 0 ohm) short-circuit.

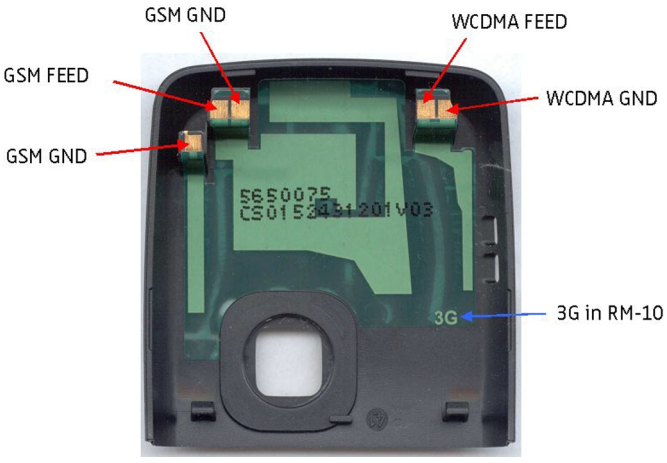

Figure 63 RM-10 antenna

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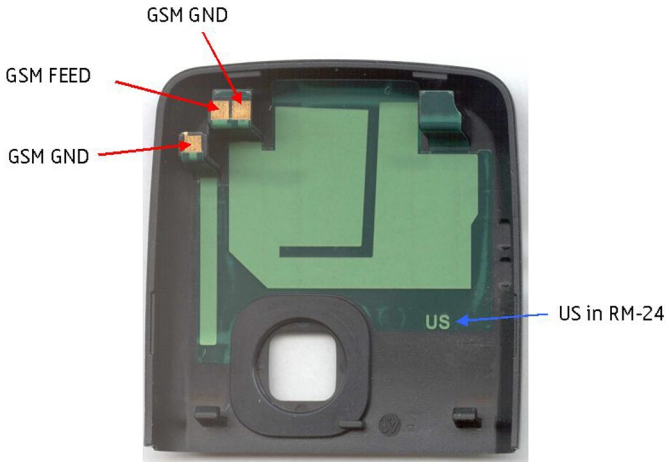

Figure 64 RM-24 antenna

The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

- One or more of the RF components is changed
- FLASH memory chip (D3000) is changed or otherwise corrupted.

Note: RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken into account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. The following table presents the RF attenuations of the product-specific module jig:

Band	Attenuation
GSM850	0.3 dB
GSM900	0.3 dB
GSM1800	0.4 dB
GSM1900	0.4 dB
WCDMA 2100	0.4 dB

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RF autotuning

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on the Partner Website or Nokia Online.

Before you can use the autotuning feature, the GPIB driver from the GPIB card vendor must be installed and running.

The autotune **.xml** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\rfconf_xx-x*.xml** (**= indicates the type designator of the phone, e.g. RM-1*)

Context

RF autotuning is performed with the aid of a digital radio communication tester.

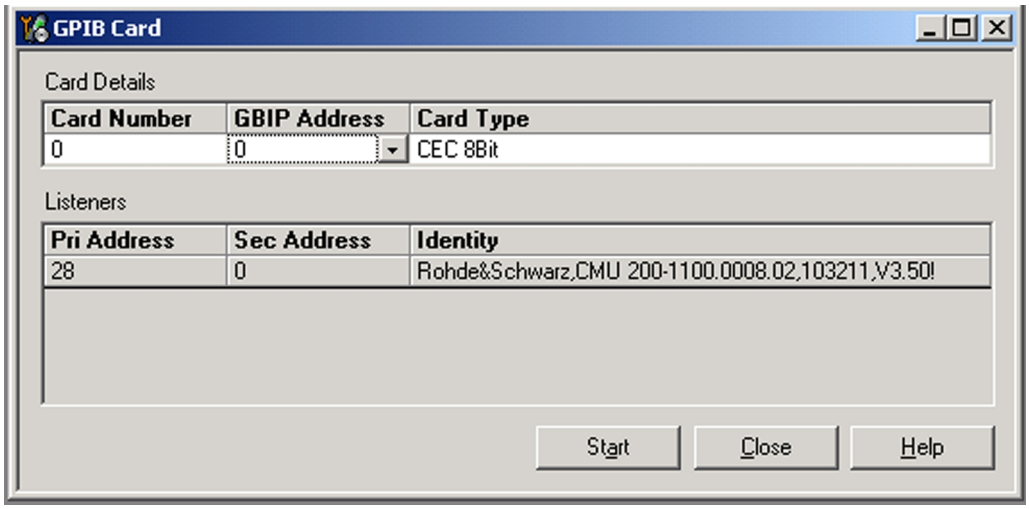
Autotuning covers all RF tunings that are needed to perform after RF component repairs.

> **Note:** Do not perform RF autotuning without a proper reason. Autotuning may only be performed after component repairs or if the RF tuning information is lost.

Steps

1. Connect the communication tester to the GPIB bus.
2. Start *Phoenix* service software.
3. Choose **Tools→Options→GPIB Card.**
4. From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.

   The name of the communication tester appears in the **Listeners** pane.



5. To specify the cable loss from a module jig to the communication tester, choose **Set Loss** from the **Tuning** menu.
6. In the *Set Loss* window, click the **Jig** tab, and select the right jig for the phone from the drop-down list.

   Alternatively, you can add a new jig by clicking **Add**, and selecting the desired jig from the list.
7. Click the **Cable** tab and add the extra cable attenuation.
8. To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
9. In the *Auto-Tune* window, click **Options**.

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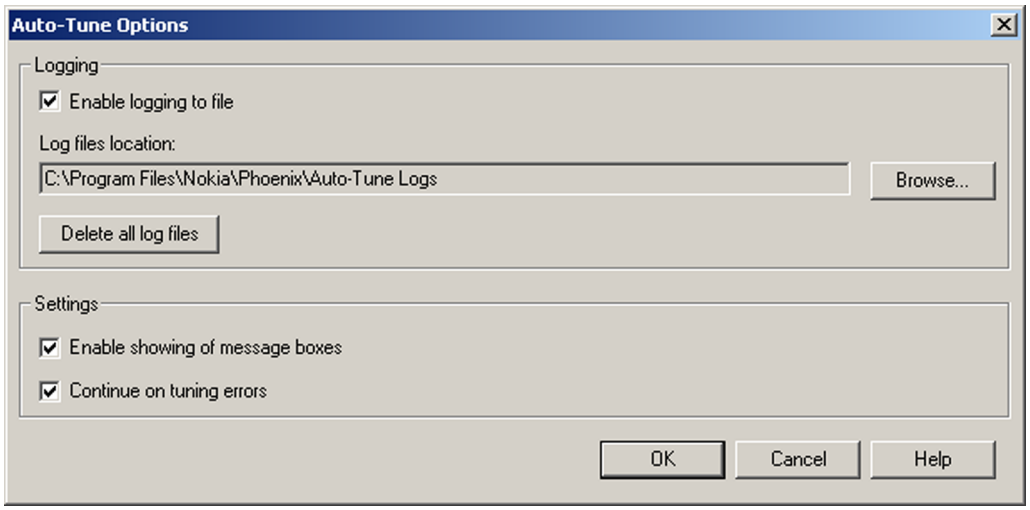
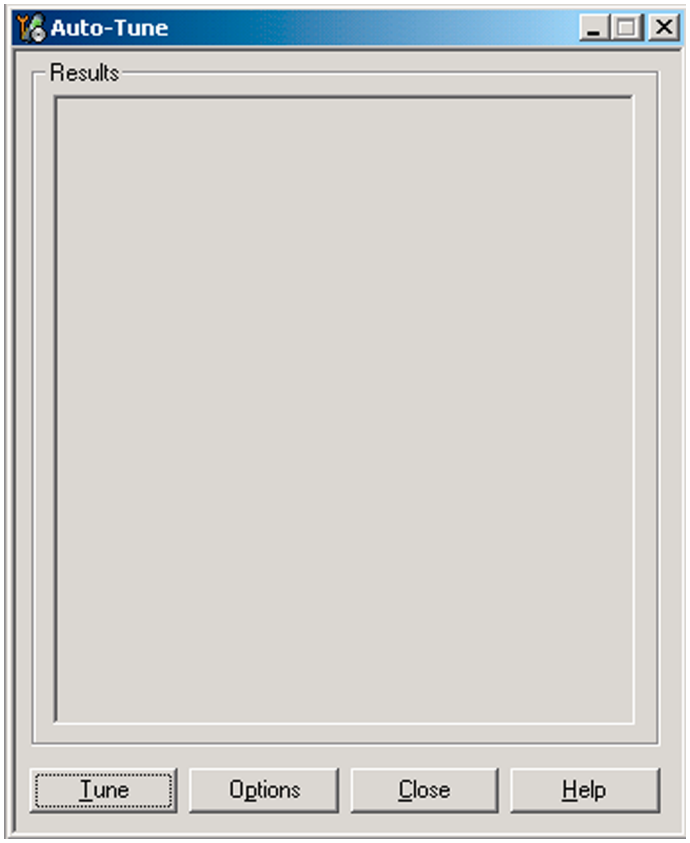
10. In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



11. Connect the phone WCDMA RF port to the communication tester, and click **Tune**.



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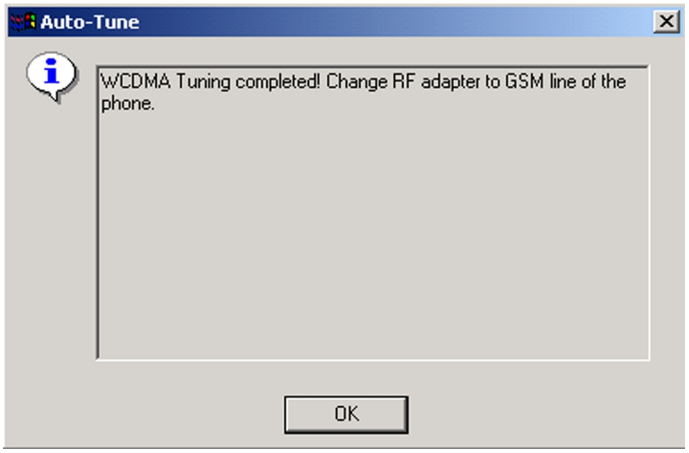
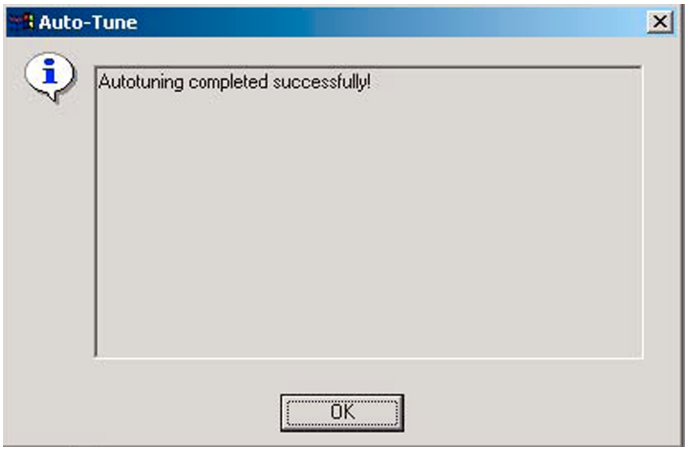
12. Change the phone RF adapter from WCDMA port to GSM port.



13. To complete the RF autotuning, click **OK**.

Results

Autotuning completed successfully! message appears.



RF manual tuning guide

Required manual tunings after component changes

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

If, however, manual tuning is used, only relevant tunings should be performed. Refer to the following table:

Changed component	Perform the following tunings
Tx RF ASIC	RF Channel Filter Calibration, Tx IQ Tuning, Tx Power Level Tuning, Temperature Sensor Calibration, TX AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
Rx RF ASIC	RF Channel Filter Calibration, Rx Calibration, Rx Band Filter Response Compensation, Rx AGC Alignment, Rx Band Response Calibration

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Changed component	Perform the following tunings
Any component in the GSM Tx RF chain before the PA	Tx IQ Tuning, Tx Power Level Tuning
Any component in the GSM Tx RF chain after the PA or PA	Tx Power Level Tuning
Any component in the WCDMA Tx RF chain before the PA	Tx AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
Any component in the WCDMA Tx or Rx chain after the PA, power detector or PA switch mode power supply	Tx AGC & Power Detector, Tx Band Response Calibration, PA Detection
Any component in the GSM Rx chain	Rx Calibration, RX Band Filter Response Compensation
Any component in the WCDMA Rx chain	Rx AGC Alignment, RX Band Response Calibration
VCTCXO	Rx Calibration (GSM850/GSM900 band)

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for both GSM and WCDMA.

Table 8 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration.**
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To end the tuning, click **Close**.

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Results

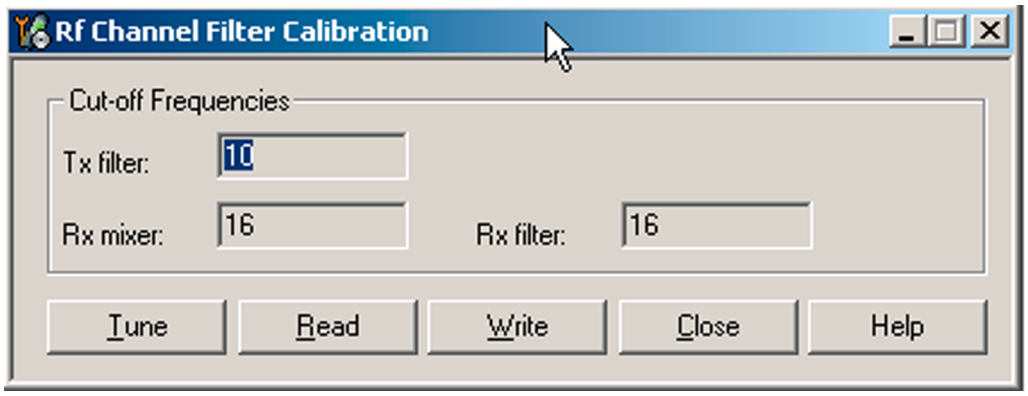

Figure 65 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

Temperature sensor calibration

Context

There is a temperature sensor integrated into one of the device ASICs. The ASIC provides DC-voltage, which is temperature dependent.

Temperature sensor calibration is done in room temperature, in which offset caused by the ASIC variation and AD-converter are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Temperature Sensor Calibration** .

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3. Click **Tune**.

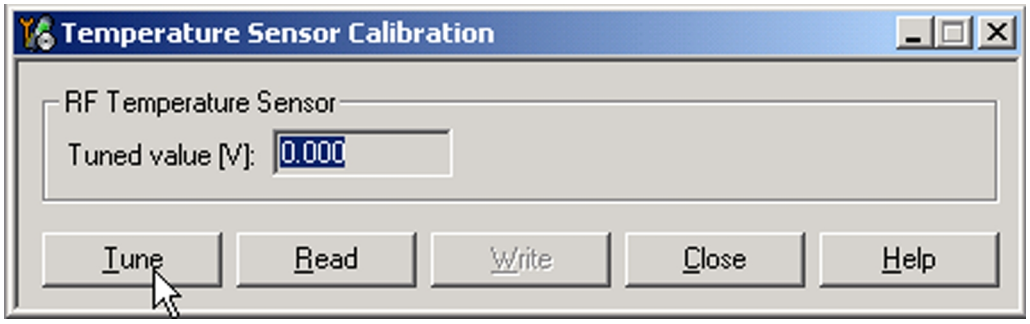


Table 9 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-20	-4	20	V

4. To save the calibration values, click **Write**.
5. To finish the calibration, click **Close**.

GSM receiver tunings

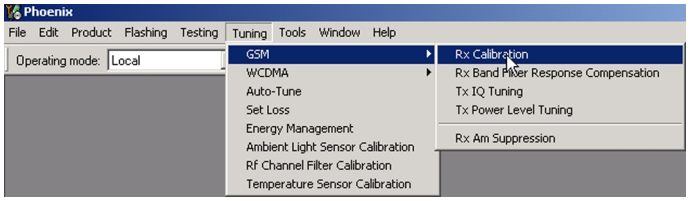
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

1. Connect the module jig's GSM connector to signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx Calibration.



4. Check the "Load from Phone" check box and clear the "Save to Phone" check box.
5. From the Band dropdown menu, choose GSM900 (or GSM850).

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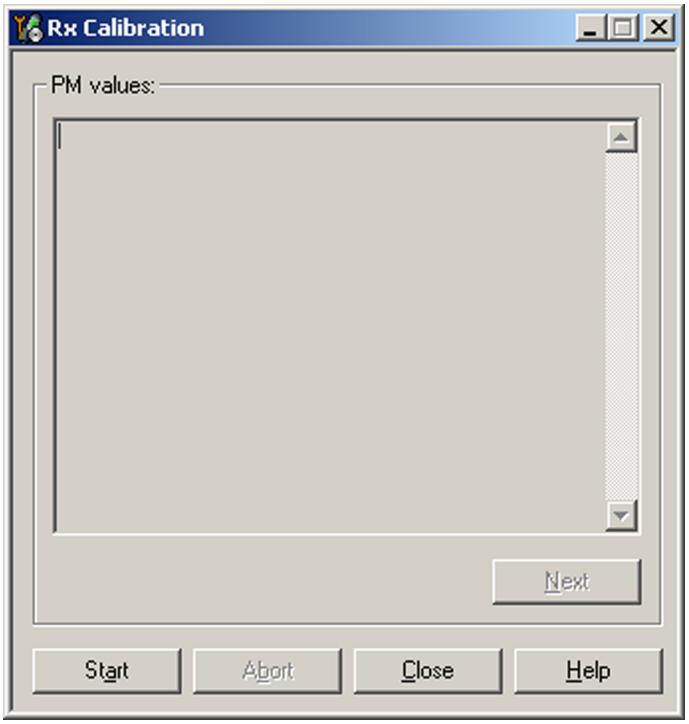
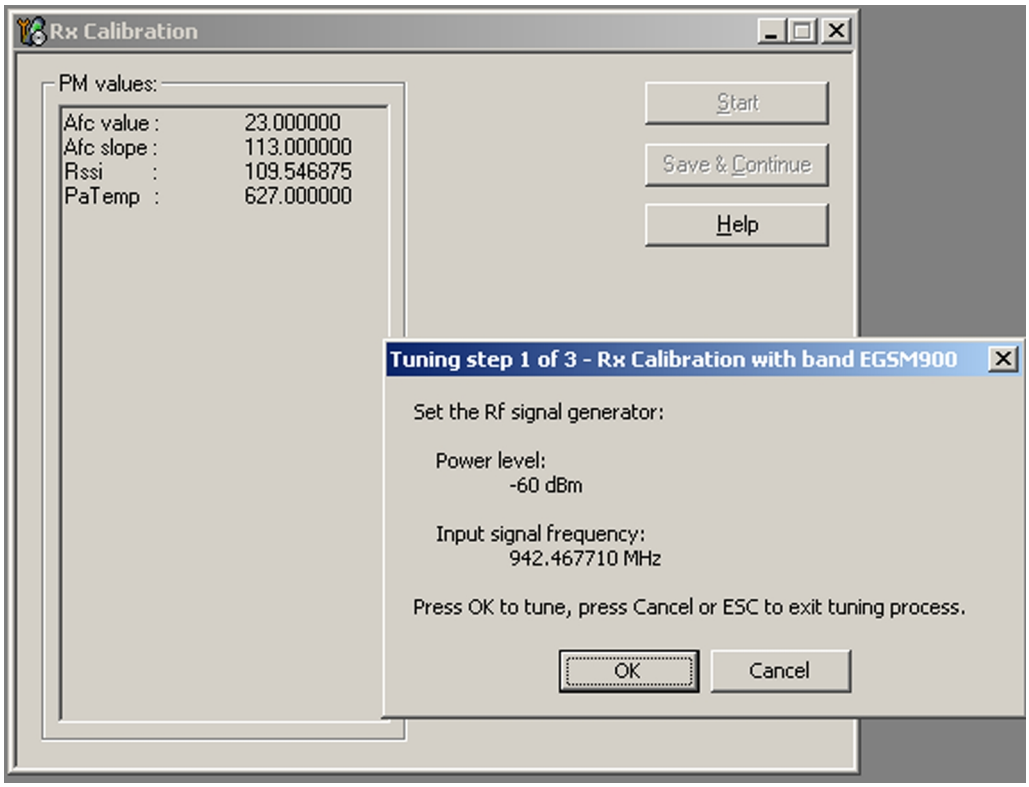
6. Click Start (if not active already).



7. Click Calibrate.
8. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Calibration with band EGSM900" popup window.

   The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!



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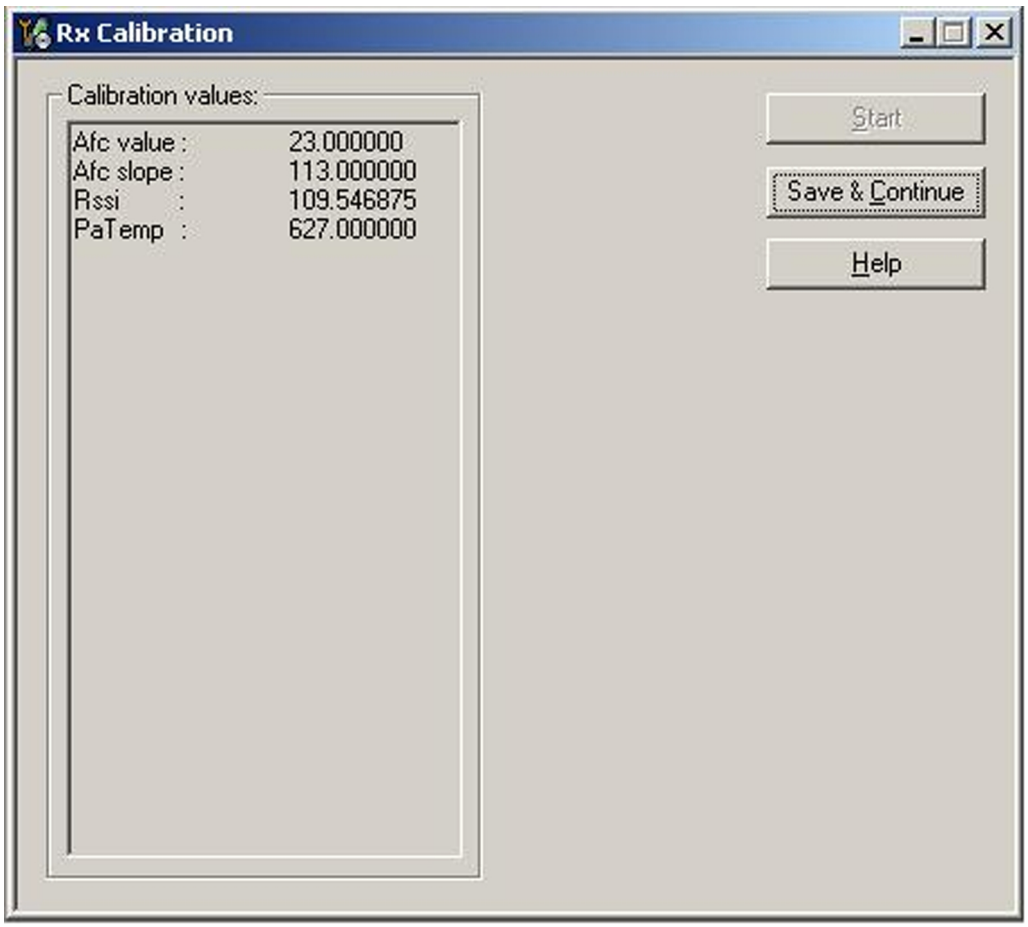
9. To perform tuning, click OK.
10. Check that the tuning values are within the limits specified in this table:

Table 10 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850/GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

11. To save values to the phone, click "Save & Continue".



12. Repeat steps 3 to 8 for GSM1800 and GSM1900.

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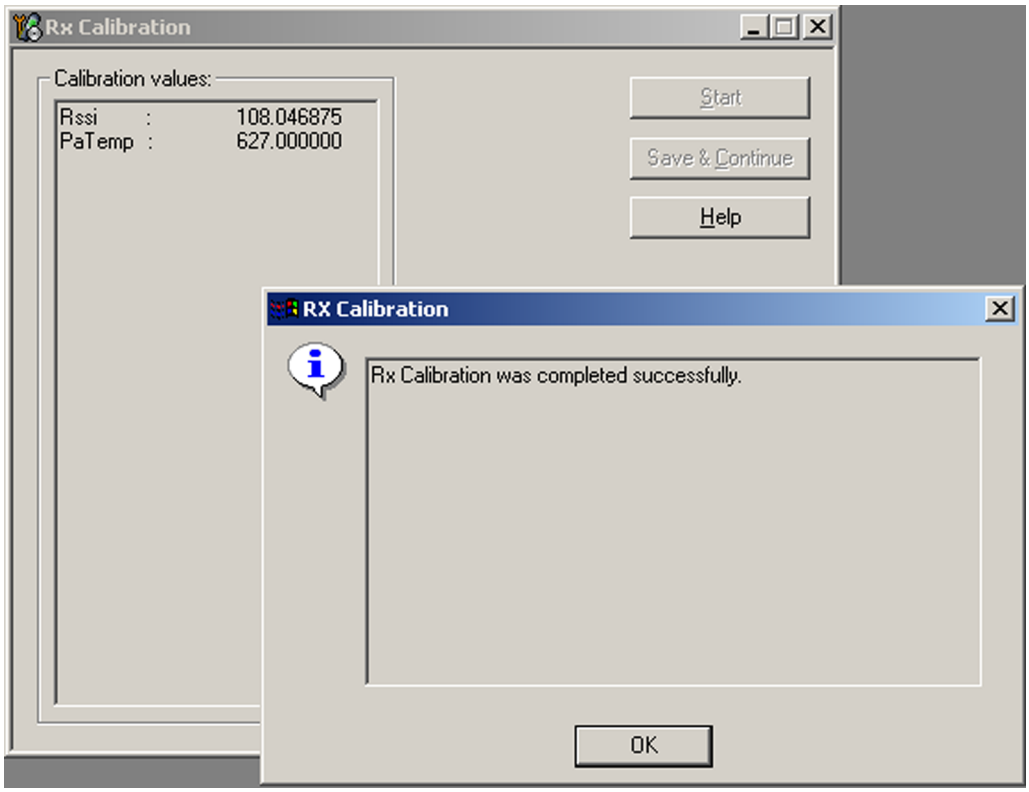
Results



Rx band filter response compensation (GSM)

Prerequisites

Rx Calibration must be performed before the Rx Band Filter Response Compensation.

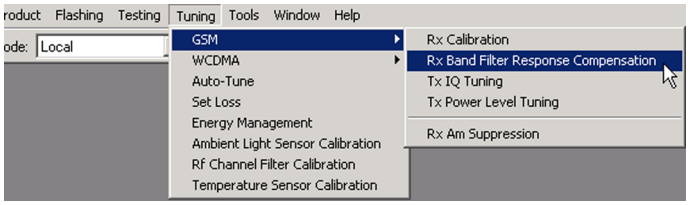
Context

On each GSM Rx band, there is a band rejecting filter in front of the HINKU front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

Steps

1. Connect the module jig's GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. Select GSM900 band (or GSM850 on RM-24).
4. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.



5. In the *Tuning mode* pane, select **Manual**.

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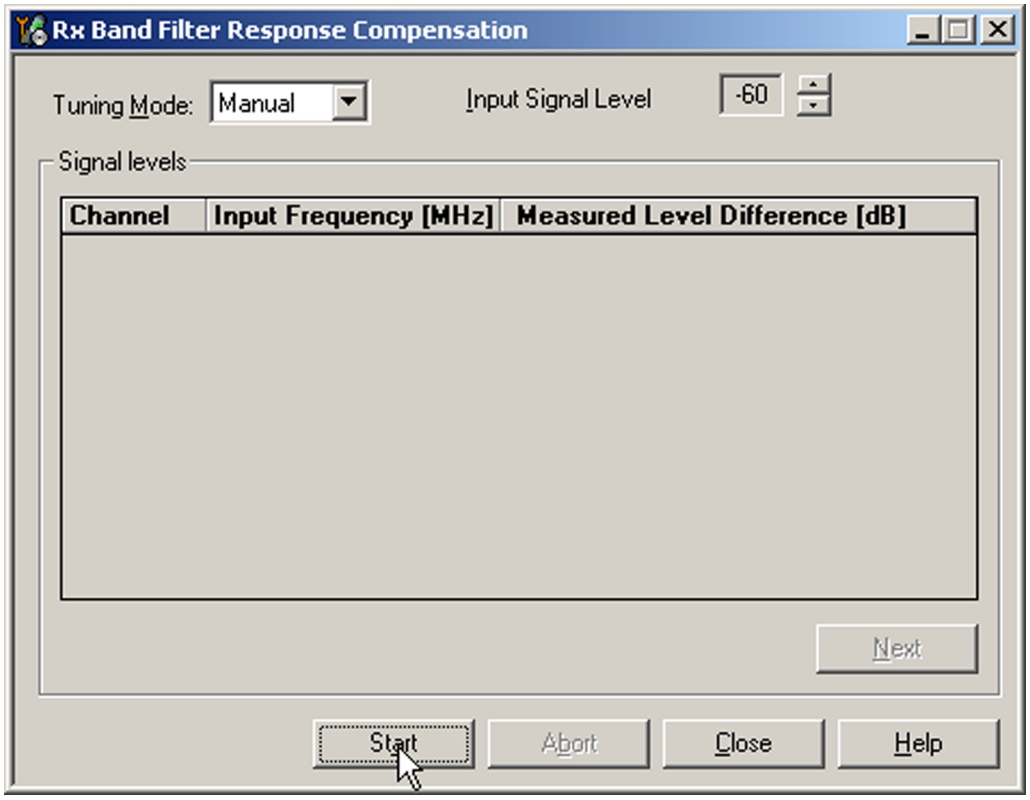
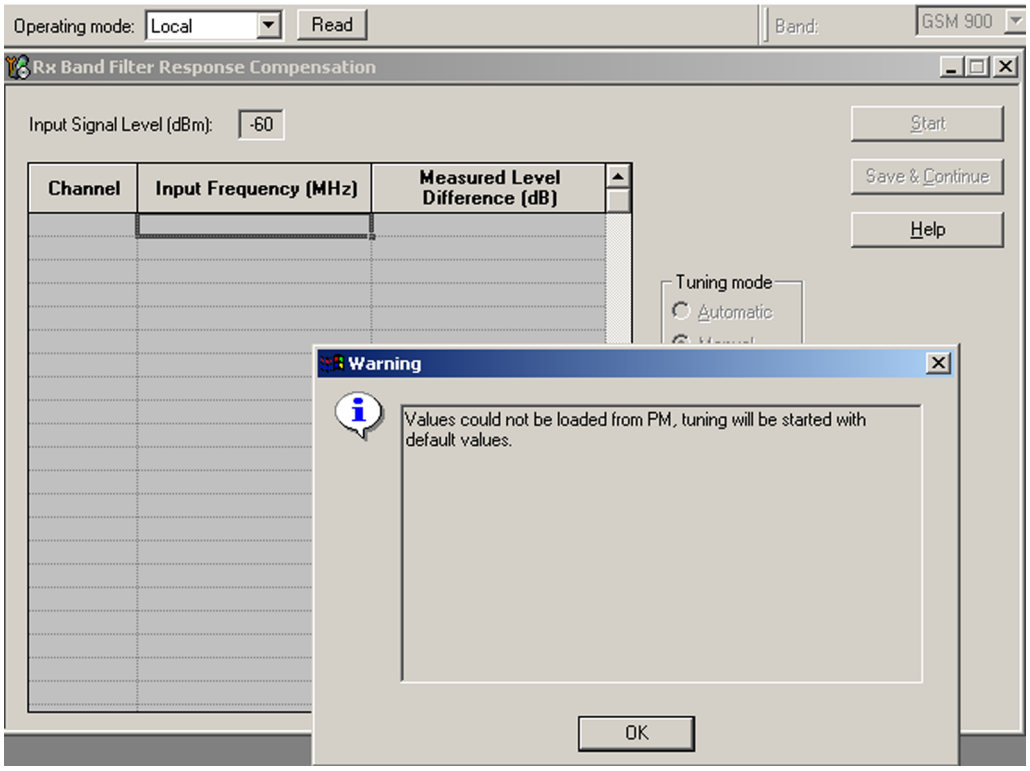
6. Click Start.



7. Click *Save & Continue*.



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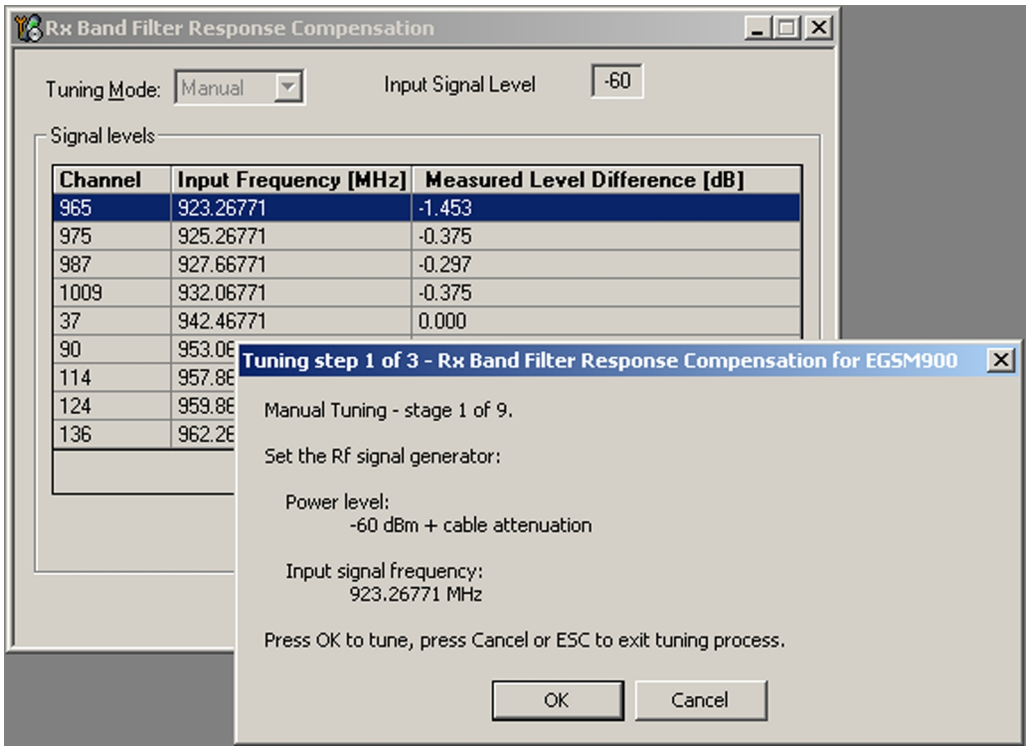
8. Connect the signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.



9. To perform tuning, click OK.
10. Go through all 9 frequencies.
11. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
GSM850/GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB

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	Min	Typ	Max	Unit
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

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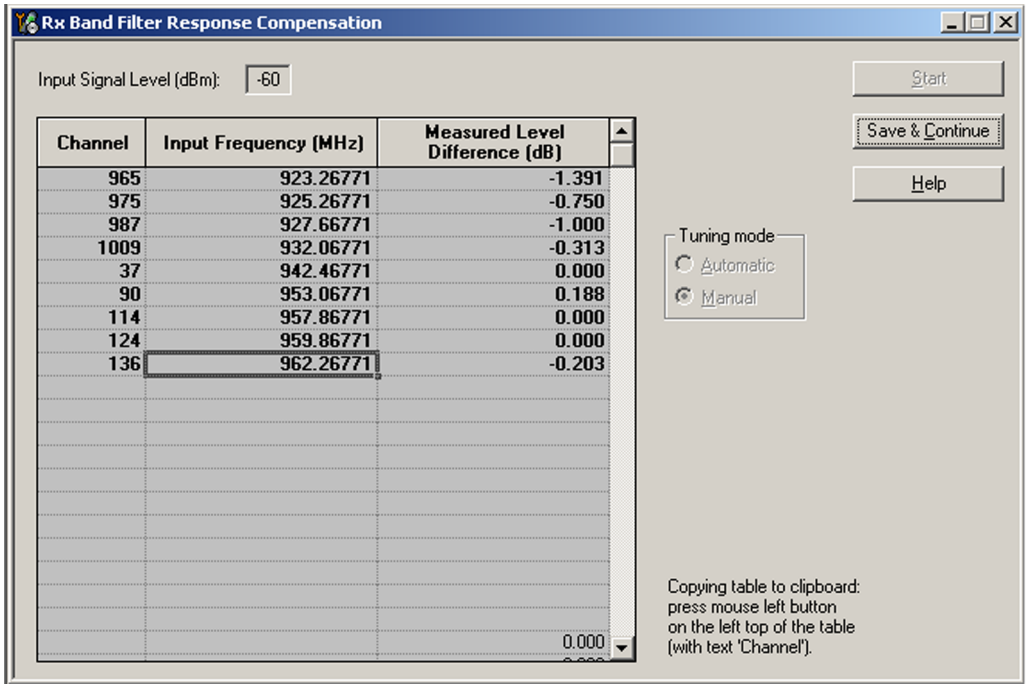
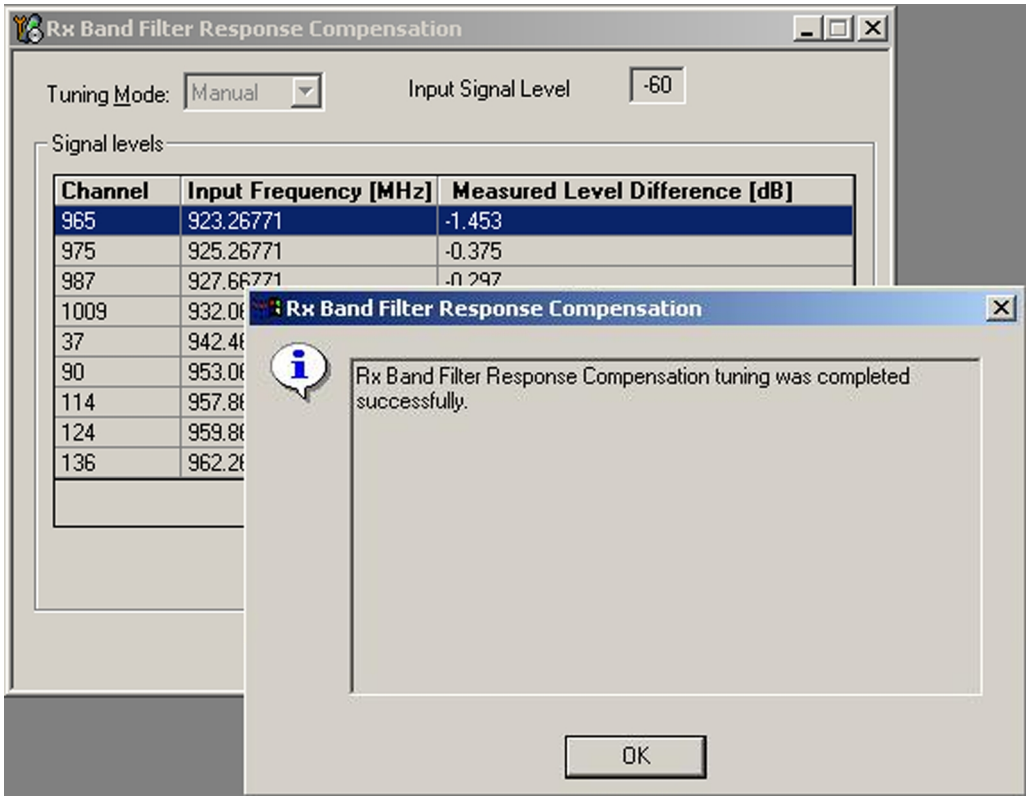
12. If the values are within the limits, click "Save & Continue".



13. Repeat the steps 4 to 10 for GSM1800 and GSM1900.

Results



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Rx AM suppression (GSM)

Context

Rx AM suppression is used to tune the AM suppression capabilities of the GSM receiver.

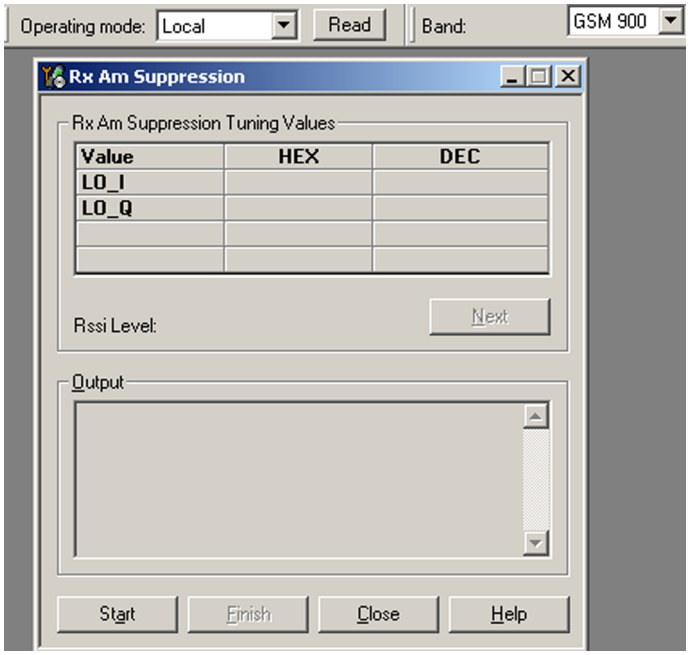
AM suppression is related to ability of the receiver to operate when there is a disturbing AM modulated signal near the received channel signal frequency.

RFIC has tunable compensation circuit which has an effect on the AM suppression ability.

In Rx AM suppression, a continuous useful signal accompanied with an AM modulated signal 10MHz above the current channel is fed to the antenna. RFIC control word values are iterated until a minimum RSSI signal is found.

Steps

1. Connect the module jig's GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx AM Suppression.
4. Select GSM900 band (or GSM850 on RM-24).
5. Click Start.



6. Connect the signal generator to the phone according to the frequency and modulation parameters displayed in the pop-up window:

Frequency	952.46771MHz / 1852.86771MHz / 1970.06771 MHz (depending on the band used)
Power level	-25 dBm / -26 dBm / -29 dBm (increase by cable and jig attenuations)
Modulation	AM
AM modulation depth	90%

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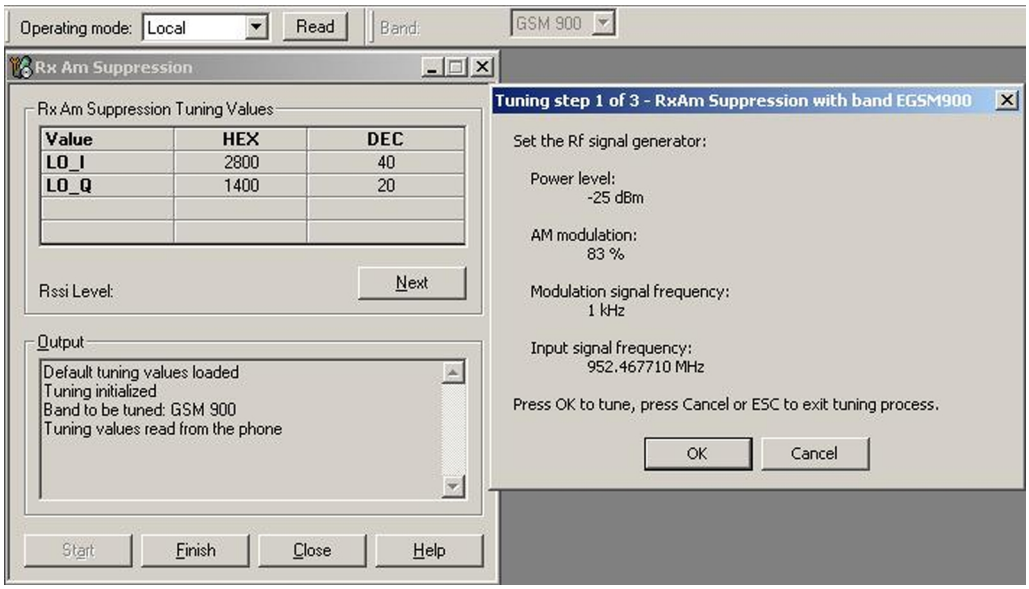
Modulation signal	50 kHz sinewave (or 15 kHz if 50 kHz is not available)

7. Click OK.



8. Check that RSSI level value is between the limits presented in the following table.

Table 11 RSSI level values

Band	Min	Max	Unit
GSM850/GSM900	-115	-90	dB
GSM1800	-115	-85	dB
GSM1900	-115	-100	dB

9. To proceed to the next band, click "Next".

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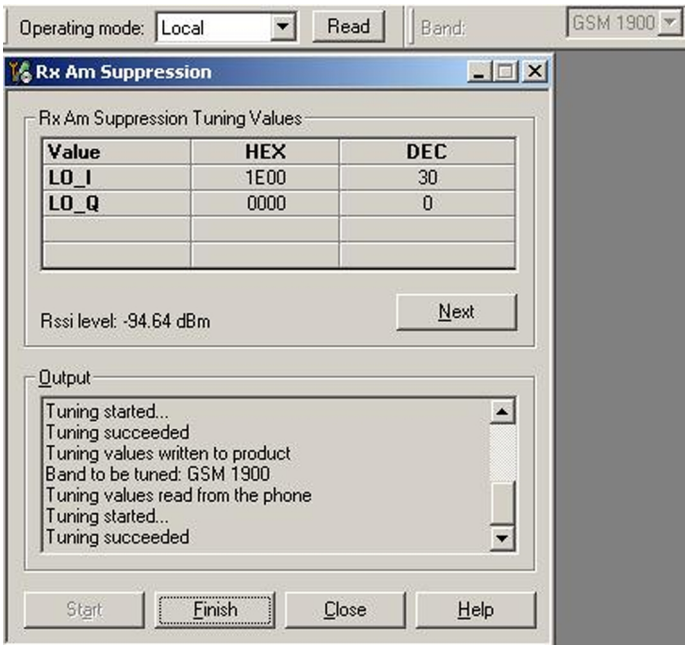
10. To end the tuning, click "Finish" and "Close".



GSM transmitter tunings

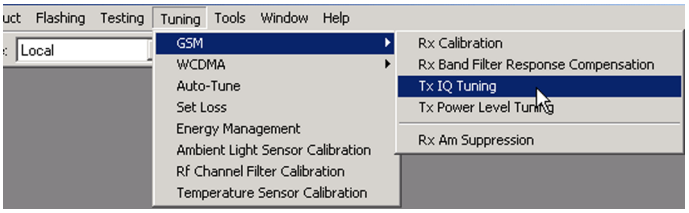
Tx IQ tuning (GSM)

Context

- The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.
- Tx IQ tuning must be performed on all GSM bands.

Steps

1. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and "Band" to GSM900 (or GSM850 on RM-24).
2. From the Tuning menu, choose GSM -> Tx IQ Tuning.



3. Set "Mode" to Automatic and "Edge" to Off.
4. Click Start.

   Wait until automatic tuning has finished and moved the sliders.

   Values are written to the phone memory automatically.

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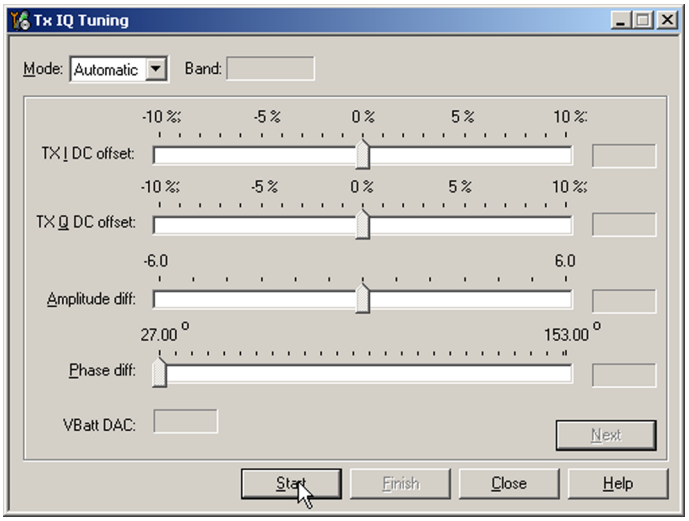
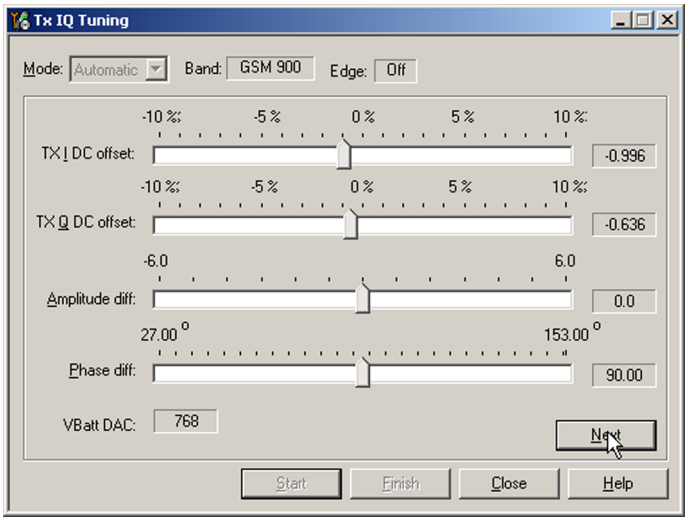


5. When the values have been written to the phone memory, click Next to change to the next band.



6. When all bands have been tuned, click Finish and Close to end the tuning procedure.

Next actions

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM850/GSM900				
I DC offset / Q DC offset	-6	-4 4	6	dB
Ampl	-1	0	1	dB
Phase	85	90	95	dB
GSM1800/GSM1900				
I/Q DC	-6	0.5	6	dB
Ampl	-1	0	1	dB

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	Min	Typ	Max	Unit
Phase	95	100	110	dB

Tx power level tuning (GSM)

Context

Because of variations at IC process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

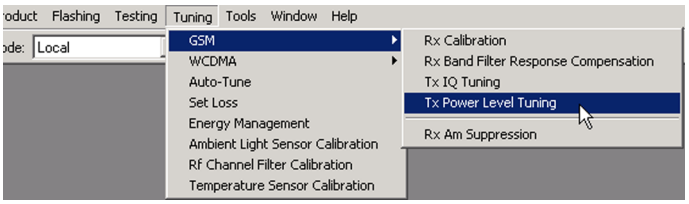
In dual or triple band phones, the power level tuning is made for both high and low PA Modes (Power Amplifier Mode) in the GSM850/GSM900 bands but only for high PA mode in GSM1800/GSM1900 bands

For EDGE transmission the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. Start Phoenix service software.
3. From the "Operating mode" dropdown menu, set mode to "Local".
4. From the Tuning menu, choose GSM -> Tx Power Level Tuning.



5. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (881.6MHz GSM 850, 897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	200 kHz
Sweep time	3s
Trigger	Video triggering: Free run
Resolution BW	3 kHz
Video BW	3 kHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

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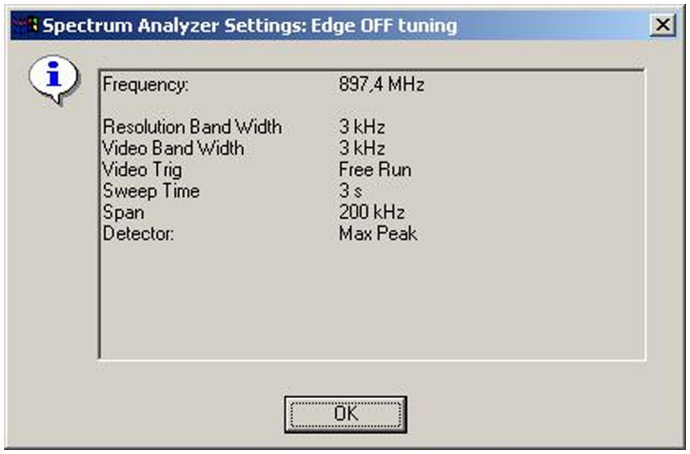
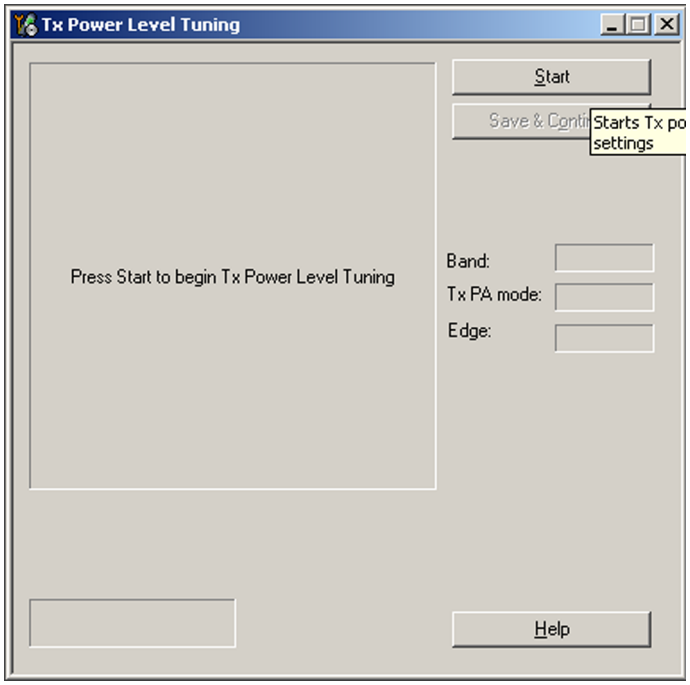


6. Click Start.



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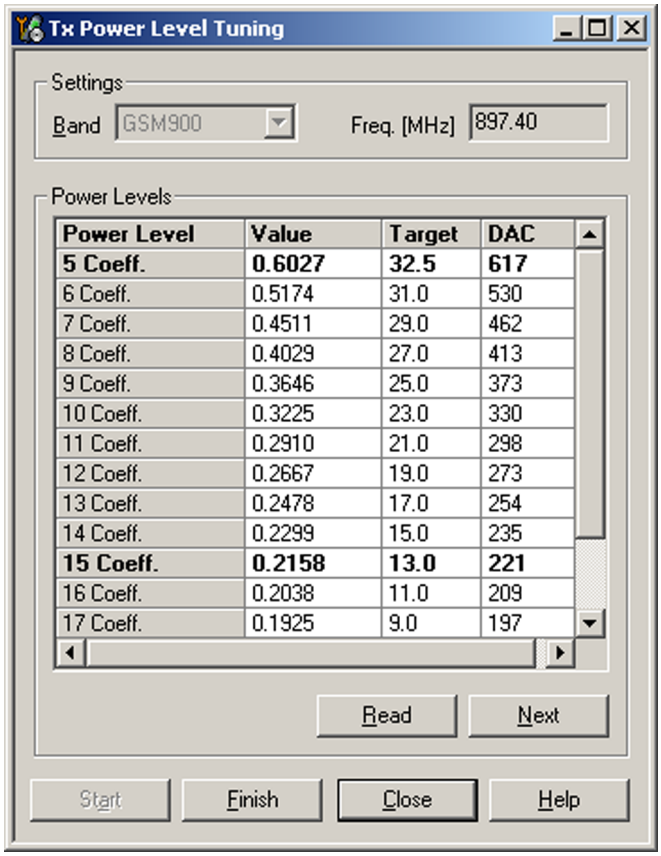
7. Adjust power levels **5**, **15** and **19** to correspond the "Target dBm" column by pressing + or – keys.



Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM850/GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM850/GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	

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	Min	Typ	Max
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

8. If the values are within the limits, click "Save & Continue" to proceed to the next band and click Start.
9. Set **Edge** mode on and start tuning again. Change video averaging to 50.
10. Tune EDGE power levels to the corresponding target power levels.
    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900.
11. When the tuning is completed, close the Tx Power Level Tuning window.

WCDMA receiver tunings

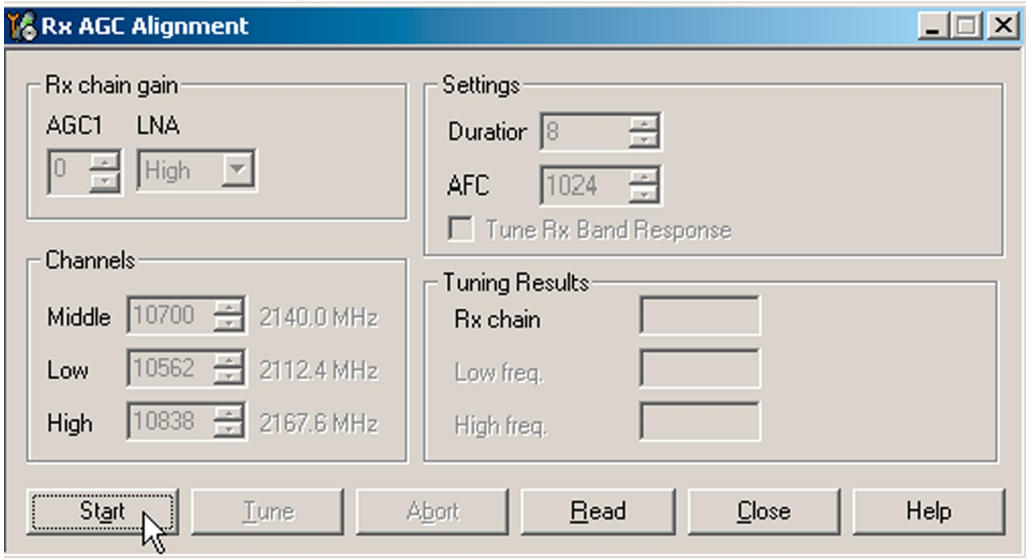
Rx AGC alignment (WCDMA)

Context

Rx AGC alignment tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. From the **Operating mode** drop-down menu, set mode to **Local**.
3. Choose **Tuning→WCDMA→Rx AGC Alignment** .
4. Click **Start** and **Tune**.



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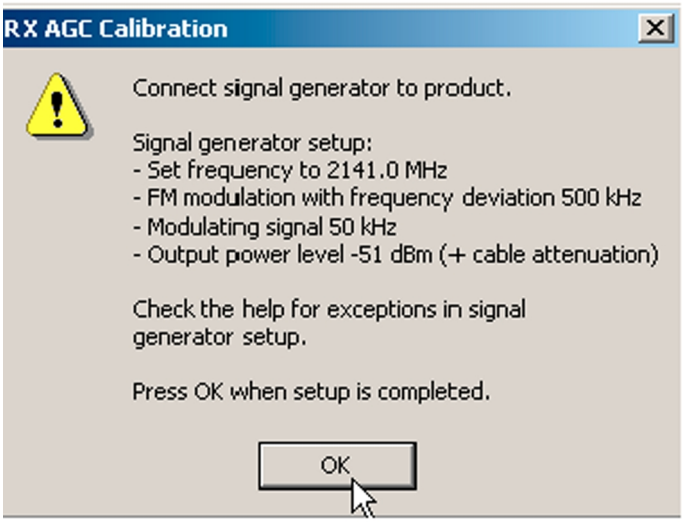
5. Setup the signal generator to correspond the values in the *RX AGC Calibration* pop-up window and click **OK**.



Frequency:	2141MHz
Level:	–51 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

6. Check that the *Rx chain* value in *Tuning Results* is within the limits presented in the following table.

	Min	Typ	Max	Unit
RX chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7... 4.0	5	
High freq	-5	-0.7... 4.0	5	

i If the Rx gain is acceptable, click **Yes** to save the results to the phone.

7. To close the *Rx AGC Alignment* window, click **Close**.

Rx band response calibration (WCDMA)

Context

There is a band rejecting filter for each WCDMA Rx band between the front end LNA and the mixer of an RF ASIC. The amplitude ripple caused by this filter causes ripple to the RSSI measurement and therefore Rx band response calibration is needed.

The Rx band response calibration can be done in two different ways. If the signal generator used supports frequency sweep table, the calibration can be done as a part of the Rx calibration. If there is no support for the frequency sweep table , it is possible to calibrate all necessary frequencies one by one.

The first set of steps shows how to perform the calibration without the signal generator sweep feature. The alternative steps give instructions how to perform the calibration if the signal generator supports frequency sweeps, and the calibration can be performed within the Rx AGC calibration.

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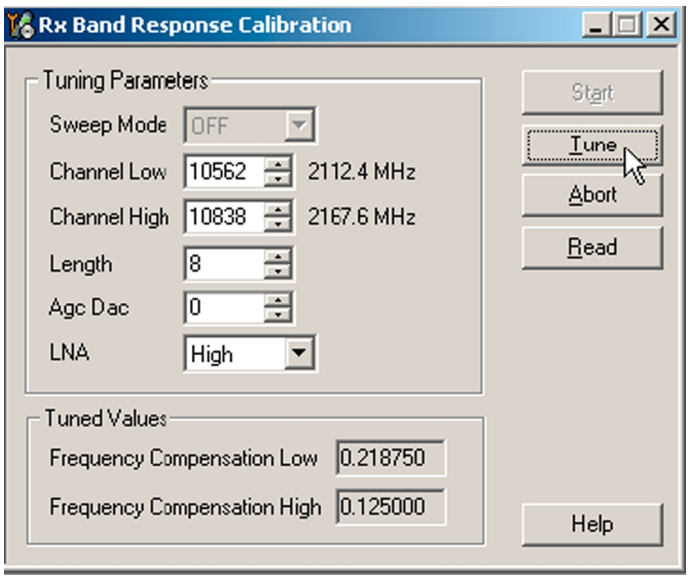
Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→Rx Band Response Calibration.**
3. Click **Start** and **Tune**.



4. Setup the signal generator to correspond the values in the pop-up window:

Frequency:	2113.4 MHz
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

5. Click **OK**.
6. Change frequency to *2166.6* MHz and click **OK**.
7. Check that the tuned values are within the limits specified in the following table :

	Min	Max
Frequency compensation low	-5	+5
Frequency compensation high	-5	+5

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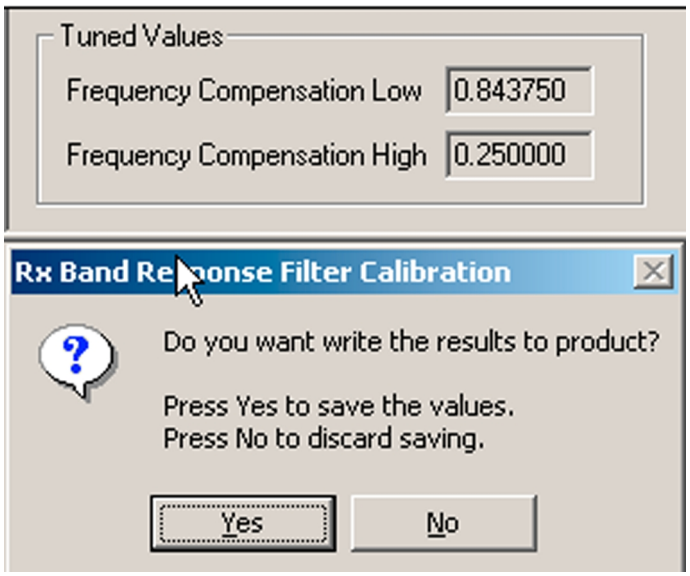
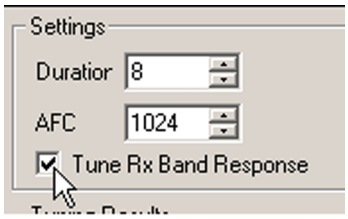
i If the values are OK, click **Yes** to save the values.



8. Close the tuning window.

Alternative steps

- From the **Operating mode** drop-down menu, set mode to **Local**.
- Choose **Tuning→WCDMA→Rx AGC Alignment.**
- Click **Start**.
- Check the **Tune Rx Band Response** check box and click **Tune**.



- Setup the signal generator according to the values in the pop-up window:

Frequency list:	2113.4 MHz, 2141 MHz and 2166.6 MHz
Dwell time:	2 ms
Sweep control:	Automatic continuous sweep
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

- Click **OK**.
- Check that the **Rx chain** , **Low freq.** and **High freq.** values in the *Tuning Results* window are within the limits presented in the following table.

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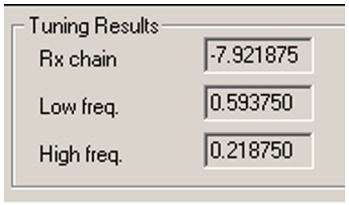

	Min	Typ	Max	Unit
Rx chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7...4.0	5	
High freq	-5	-0.7...4.0	5	

- If the Rx gain is acceptable, click **Yes** to save the results to the phone.
- To end the calibration, click **Close**.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see Alternative steps (page 7–50).

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→Tx AGC & Power Detector.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).

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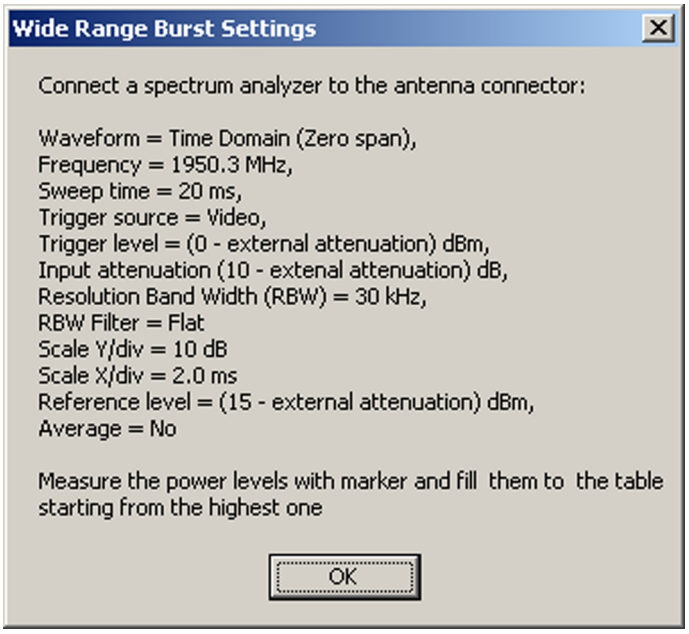
5. Set up the spectrum analyzer in the following way:



6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker.

   Take the first measurement from 250 us after the trigger, the second from 750 us, the third on 1220 us and so on in every 500 us until the table is filled.

   Note: It must be possible to measure power levels down to –68 dBm. The measured power levels must be monotonously decreasing.

   Make sure that the marker is not measuring the level of noise spike on lower levels.

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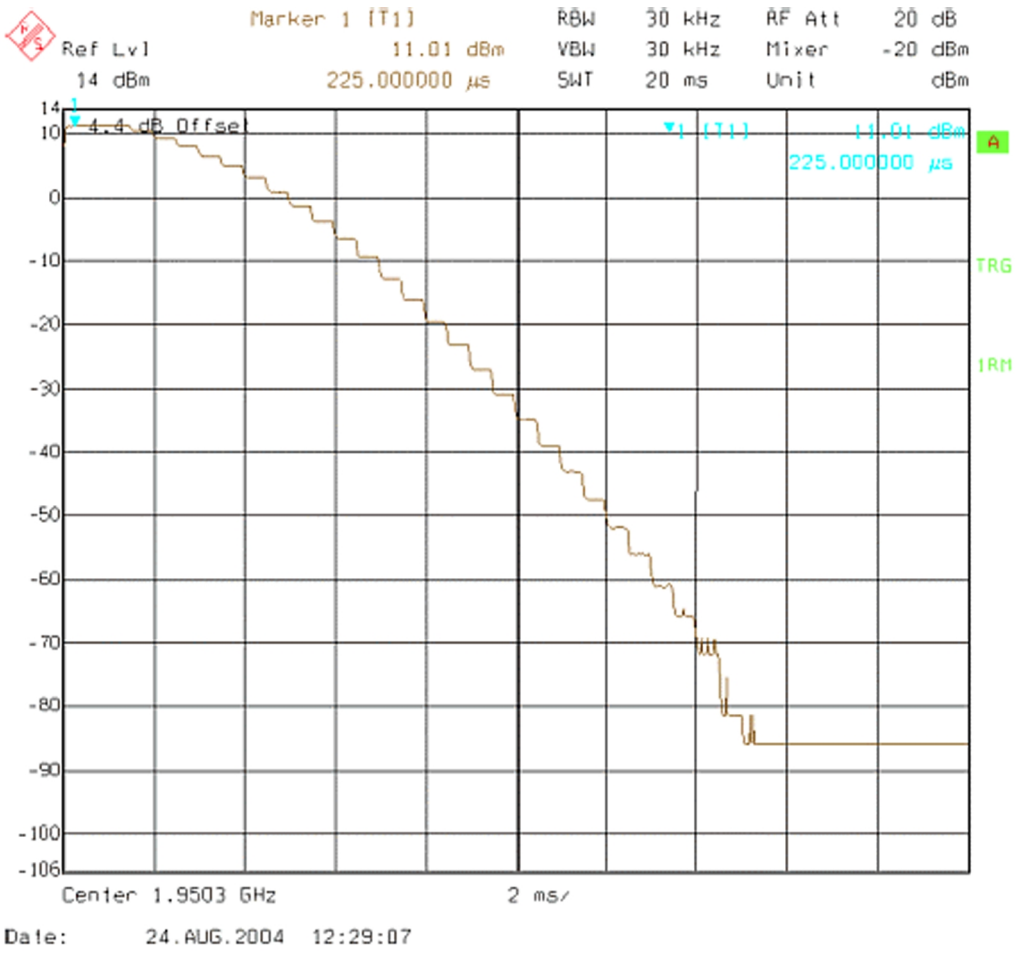

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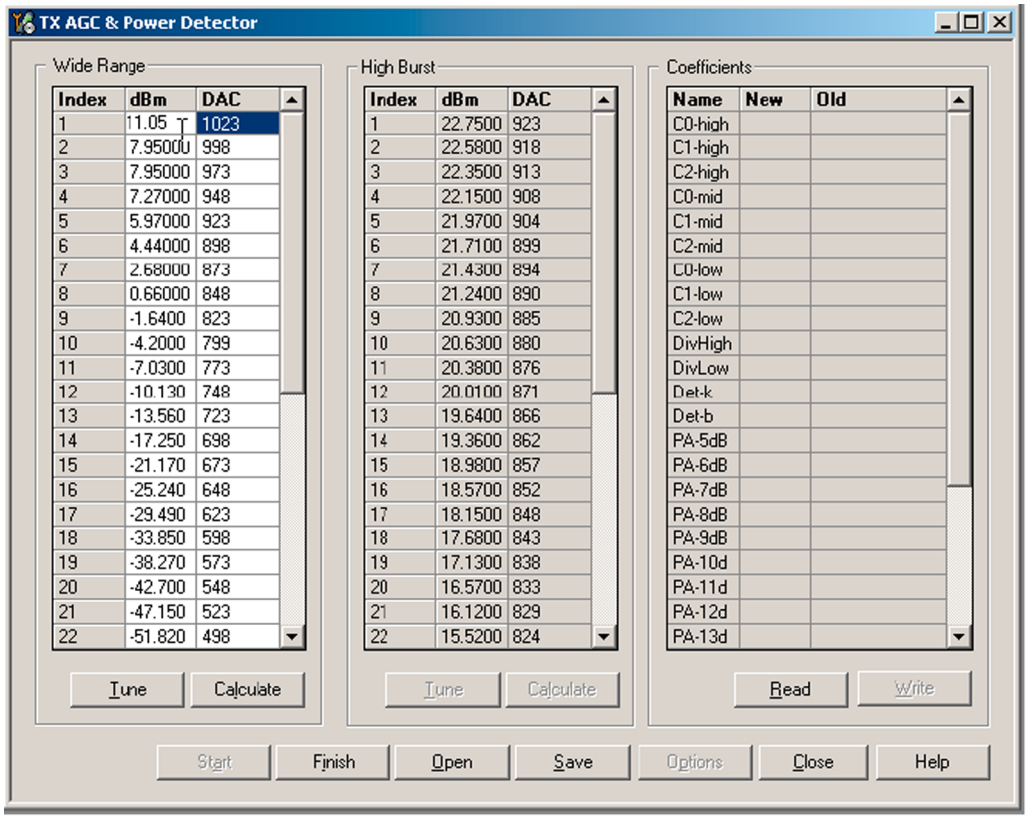
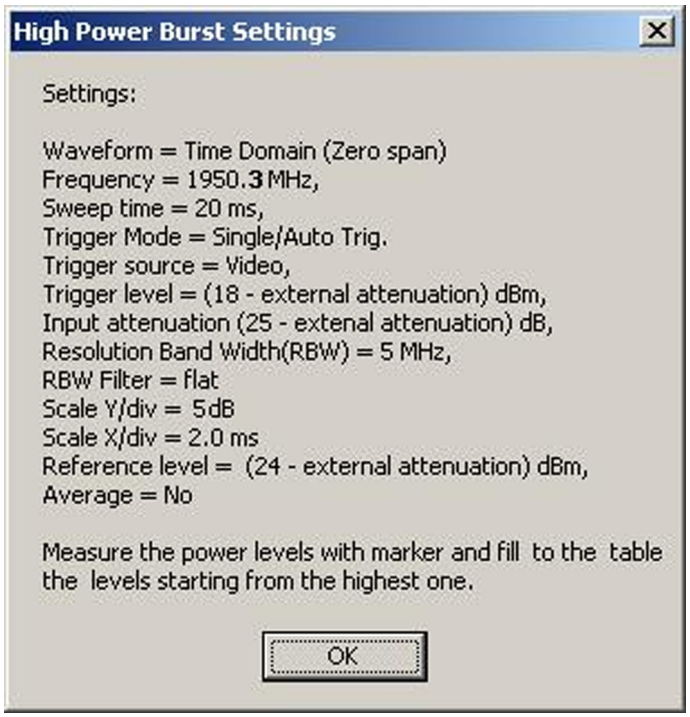
8. Fill in the power level values (in dBm) to the *Wide Range* table.



9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings:



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12. Measure the power levels with a marker.

    Take the first measurement from 250 us after the trigger, the second from 750 us, third on 1220 us and so on in every 500 us until the table is filled.

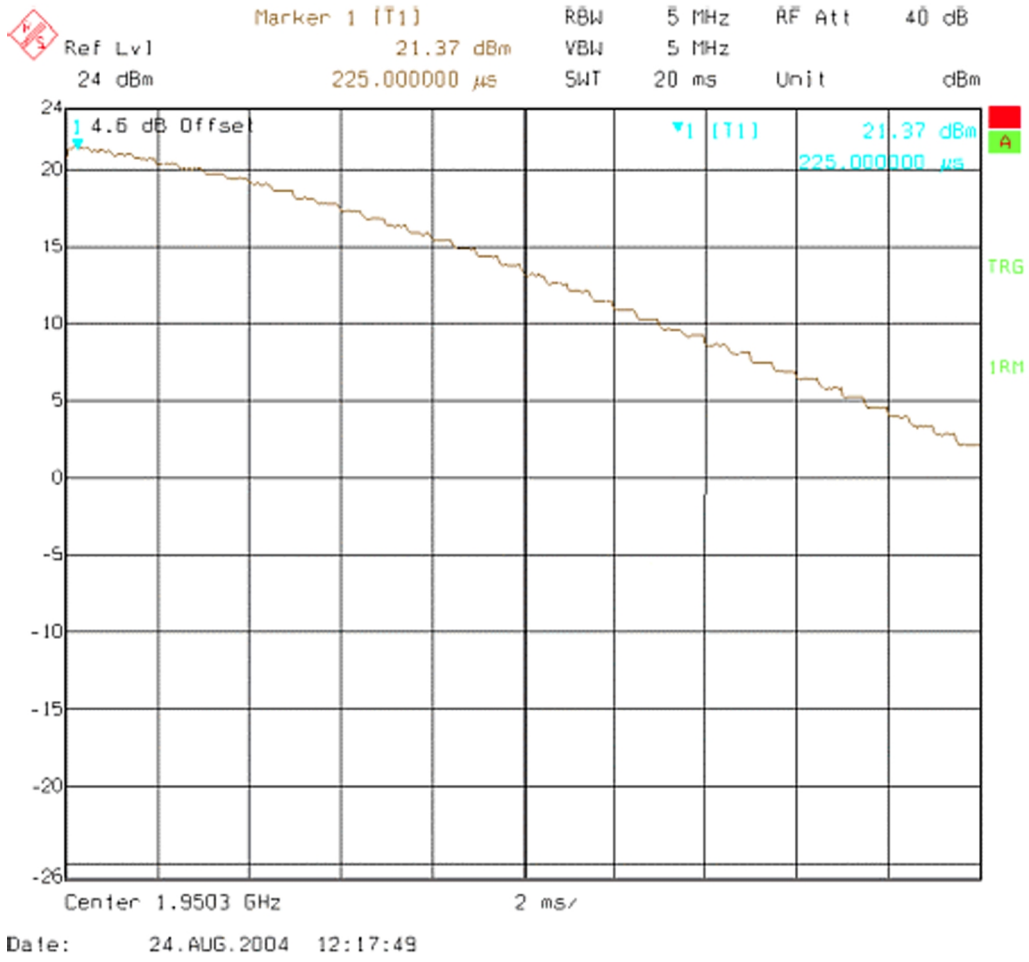

Figure 66 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000

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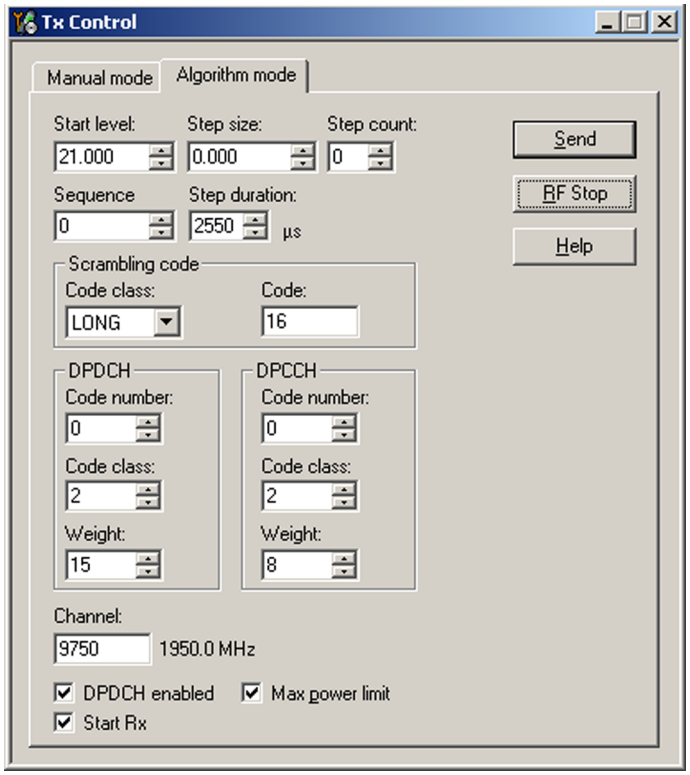
	Min	Max
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**
18. Select the *Algorithm* mode tab.



19. Write the target power level 25 dBm to the *Start level* line and check the **Max power limit** check box (detector calibration check).
20. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950.3 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm or -20 dBm depending on the level measured**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms
Detector:	**RMS detector**

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Average:	No
Trigger:	Free run

21. Click **Send**.
22. Measure the WCDMA output power.

    It should be around 21 dBm.
23. Click **RF Stop** and uncheck the **Max power limit** check box.
24. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Alternative steps

- Measure the wide range levels normally and write down the levels that are possible to measure.
- Click **Finish**.
- Click **Options**.
- Change the first wide range DAC value to *573* and change the number of tuning steps to *21*.
- Change the spectrum analyzer reference level to *–20* dBm and adjust the input attenuator to the lowest value possible.
- In the *Wide Range* pane, click **Tune** and fill in the rest of values starting from the 19th level.

Tx band response calibration (WCDMA)

Context

The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to edit the numbers of channels used in this tuning operation.
- If the **Calibrate Detector Response** check box is checked, only Tx response is calibrated. Zero is written to the power detector compensation values block in the permanent memory (PM) of the terminal.
- **Detector Calibration level** shows the power level used for calibrating the power detector in this tuning procedure.
- **Tx Calibration level** shows the power level used for calibrating tx frequency in this tuning procedure.
- In *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- **Abort** button aborts the tuning operation without saving the tuned values.
- **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.
2. Choose **File→Scan Product** .

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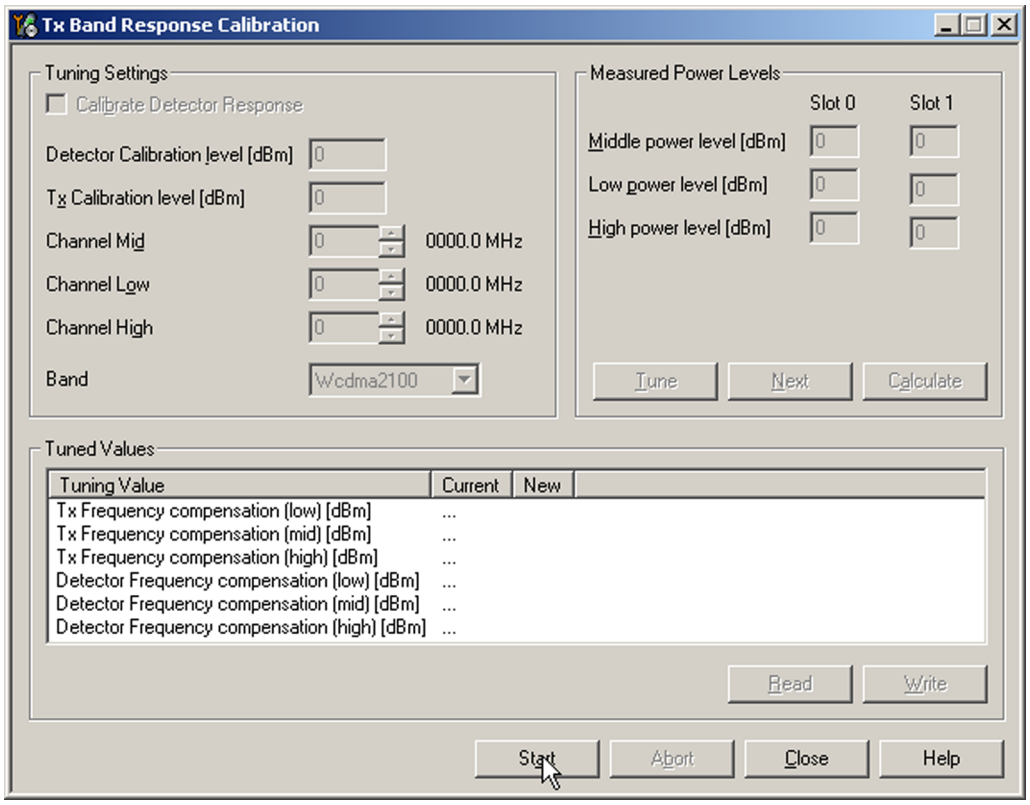
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .
5. Click **Start**.



The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the power meter to the terminal, and set it to **Channel Mid** frequency.
8. Read the values of slot 0 and slot 1 from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.

   Slot 0 is used for detector calibration and slot 1 for Tx calibration.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

    The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

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	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

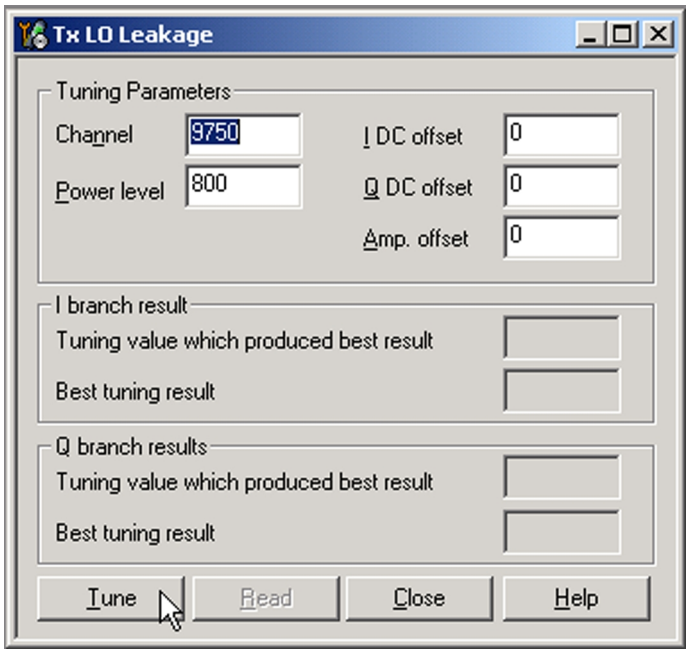
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→ Tx LO Leakage** .
3. Click **Tune**.



4. To end the tuning, click **Close**.

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8 — Camera Module Troubleshooting

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1 Camera is not functional at all; no image can be taken.

2 Images can be taken but there is nothing recognizable in them.

3 Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Terms

Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor; for example, RM-10/ RM-24 has a 1600 x 1200 pixel sensor resolution. In some occasions the term resolution is used for describing the sharpness of the images.

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Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.
Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Distance to target

The lens in the module is specified to operate satisfactorily from 64 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 64 cm. The lack of sharpness is first visible in full resolution images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.

Figure 67 Blurred image. Target too close.

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

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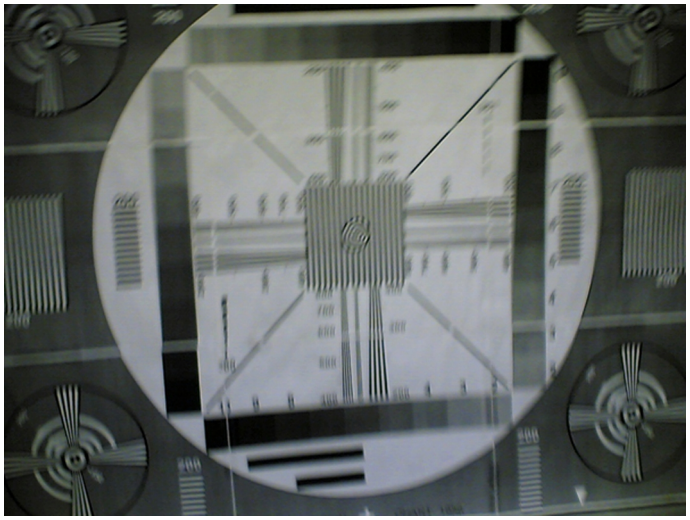

Figure 68 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

Figure 69 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

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Figure 70 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

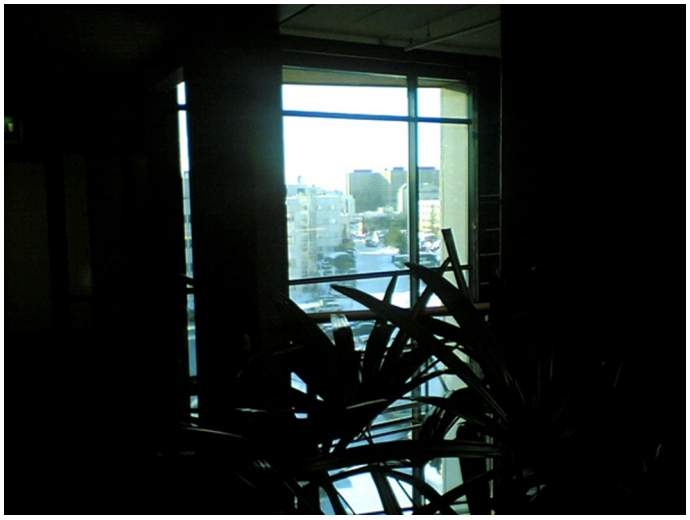

Figure 71 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

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Figure 72 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

Figure 73 A lens reflection effect caused by sunshine

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Examples of good quality images

Figure 74 Good image taken indoors

Figure 75 Good image taken outdoors

Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

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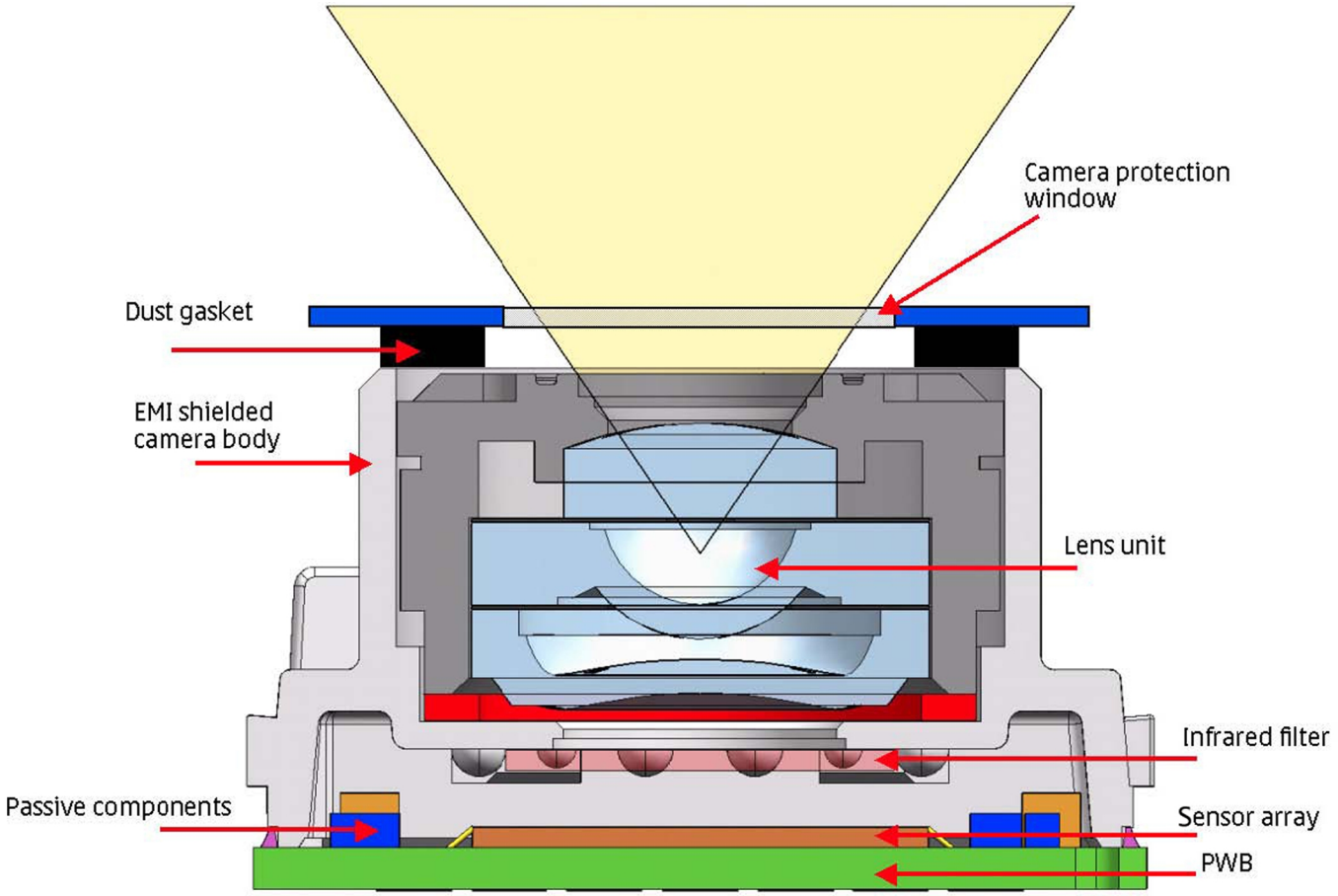

Figure 76 Camera module cross section and assembly principle

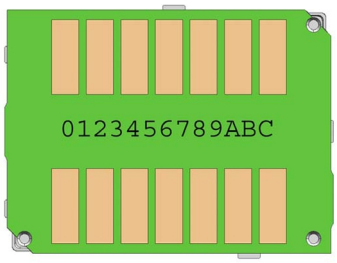

Figure 77 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colors. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Socket type connection

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- Laser-marked serial numbering on PWB (for versioning)
- Passive components
- Camera protection window; part of the phone cover mechanics
- Dust gasket between the lens unit and camera protection window

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

For detecting dust problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC CRT monitor is preferred for analysis (avoid using LCD). Search carefully because finding these defects is not always easy. Figure "Effects of dust on optical path" is an example of an image having easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. Another option is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering occurs, try to reduce the illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Therefore it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If dust particles are lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

Figure 78 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between the camera window and the lens, they will cause image blurring and poor contrast. If dust stays on the camera module surface, camera cussion, camera bezel or window at assembling, dust may sneak into the optical system as the optical zoom or Auto focus lens moves back and forth. The camera cussion and bezel between the window and the lens unit or camera module should prevent any particles from getting into the cavity after the manufacturing phase.

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If dust particles are found on the sensor, this is classified as a manufacturing error of the module, and the camera should be replaced. Any particles inside the cavity between the protection window and the lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are six possible sources for the problem:

1 The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.

2 The photographed object is too close – the camera lens operates with distances from 64 cm to infinity. This is no cause to replace camera module.

3 User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.

4 There is dirt between the protection window and camera lens.

5 The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

6 The camera lens is misfocused because of a manufacturing error.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene can be used as a target. The main considerations are:

- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.

   Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next actions

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Dirty camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

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It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

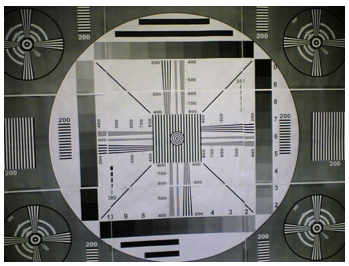

Figure 79 Image taken with clean protection window

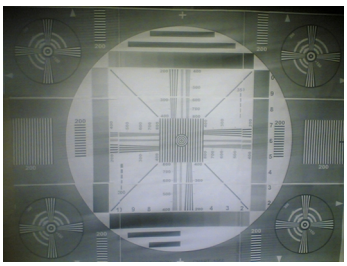

Figure 80 Image taken with greasy protection window

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

Figure 81 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

> **Note:** At the most 5 clusters of black dots or blemish are not considered errors, and no reason to replace camera module

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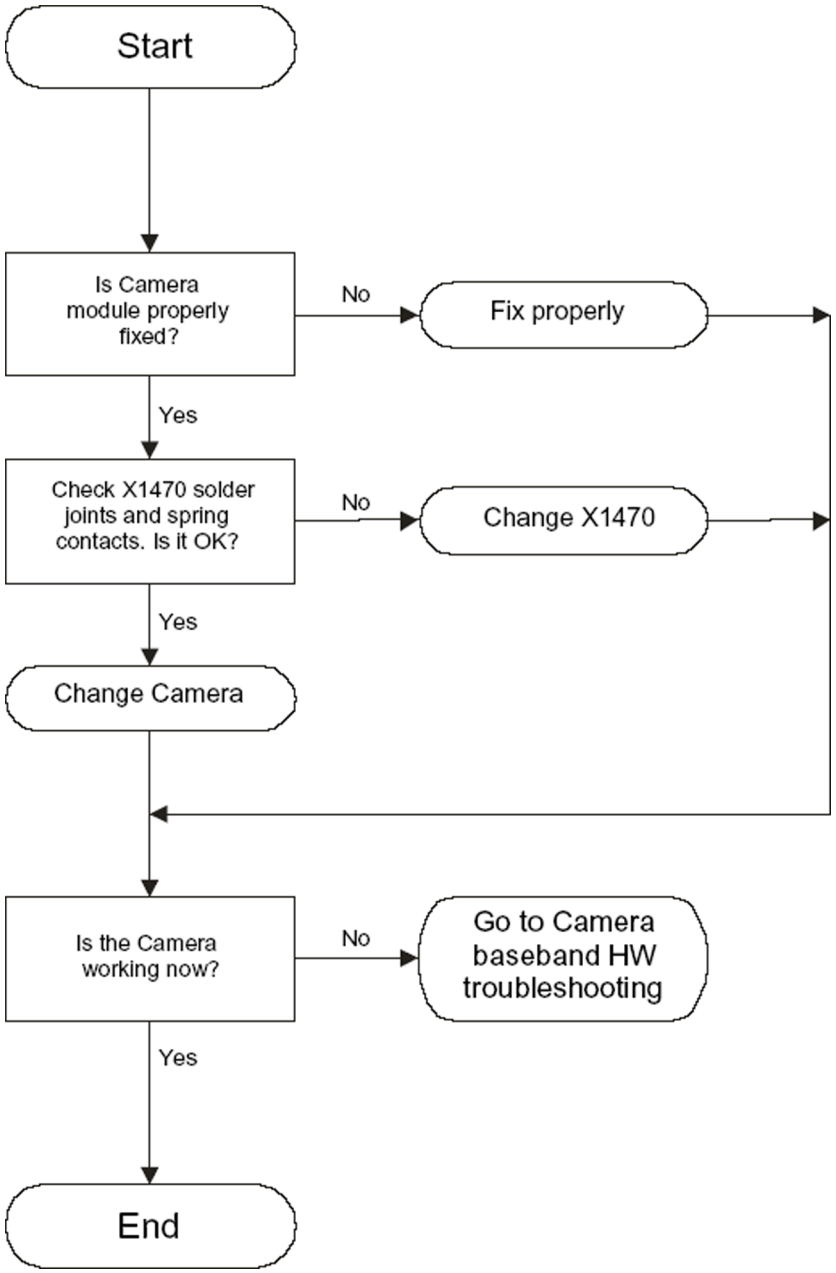
Camera troubleshooting flowcharts

Camera hardware failure message troubleshooting

Troubleshooting flow



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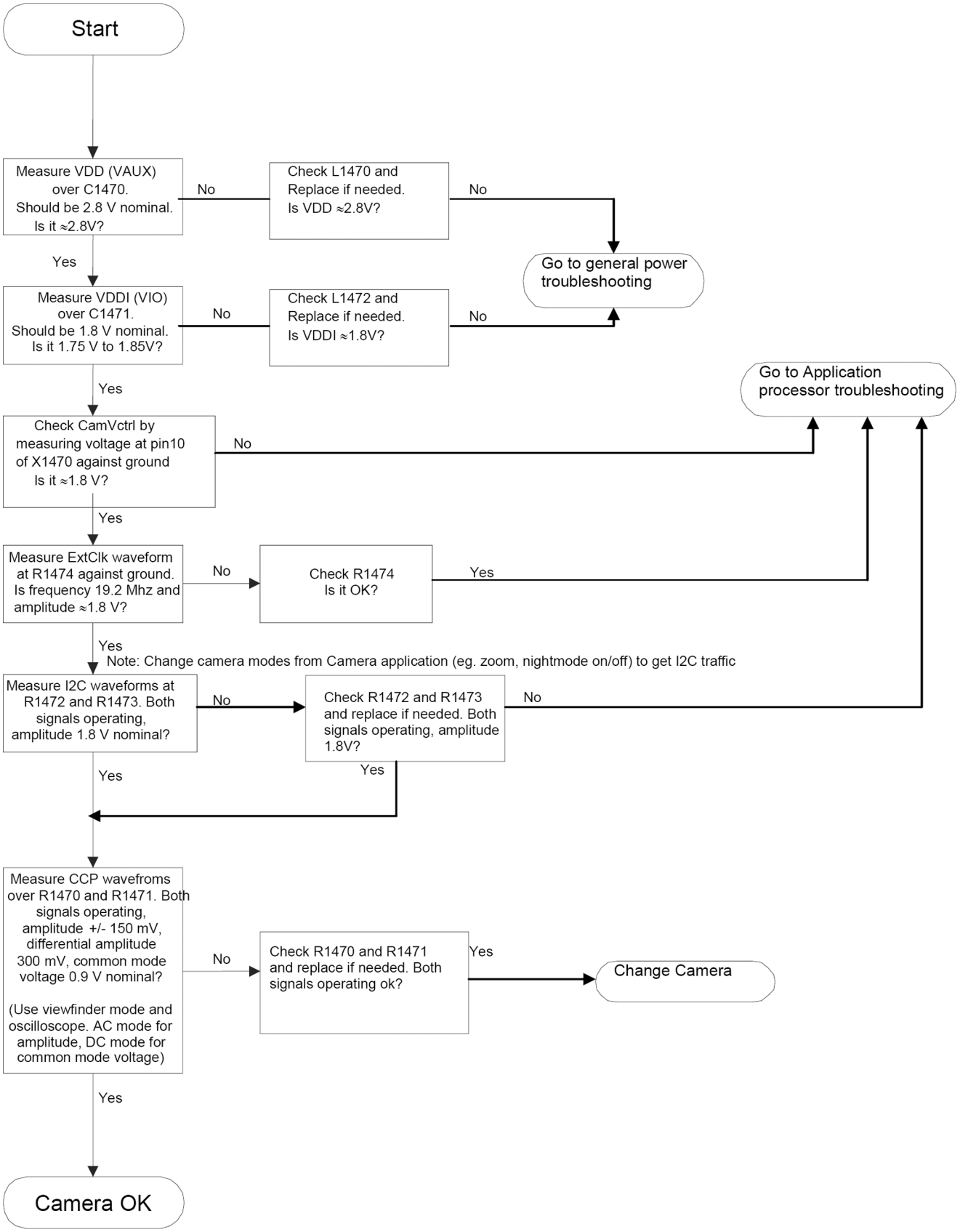
Camera baseband hardware troubleshooting

Troubleshooting flow



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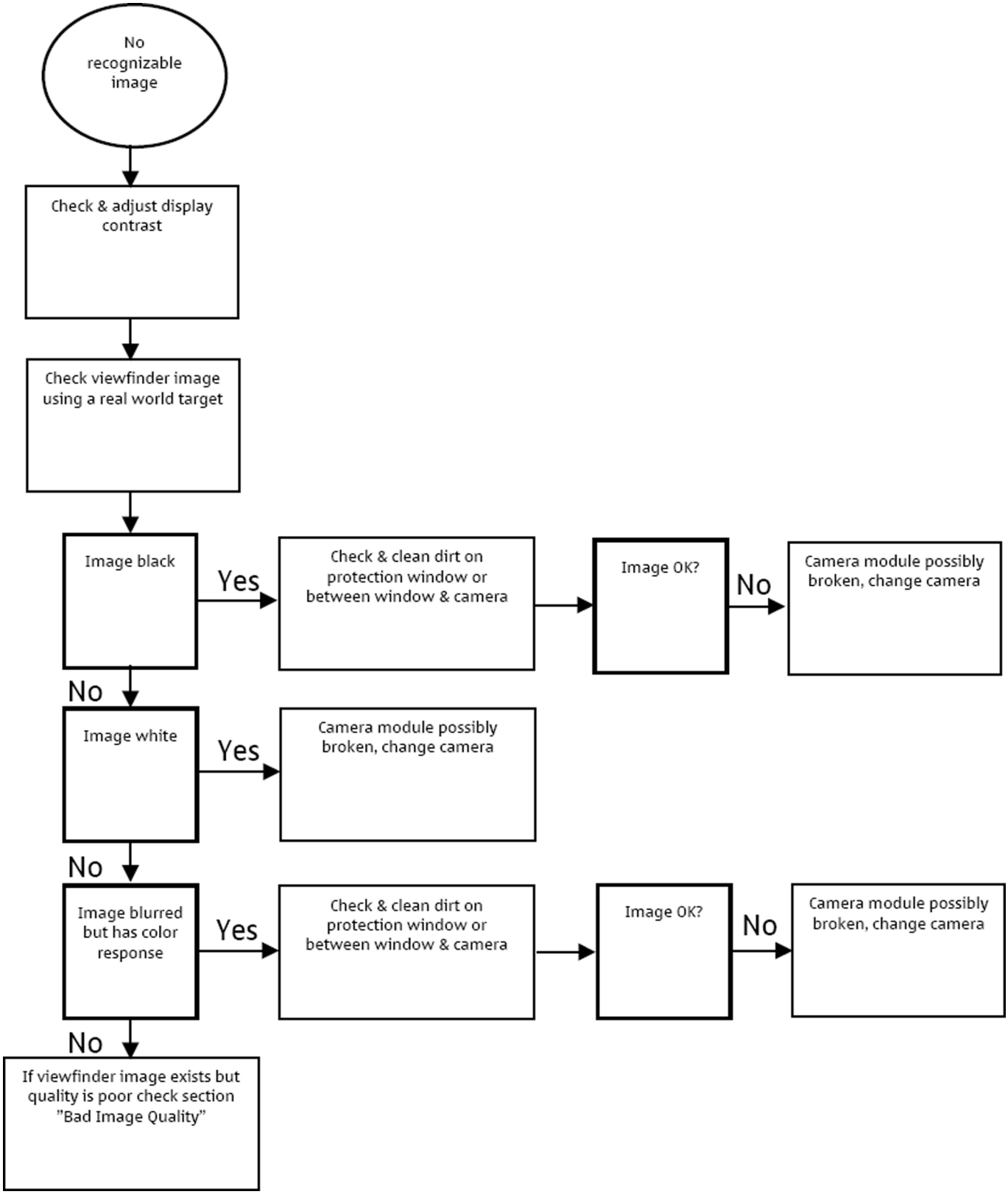
Front camera viewfinder troubleshooting

Troubleshooting flow



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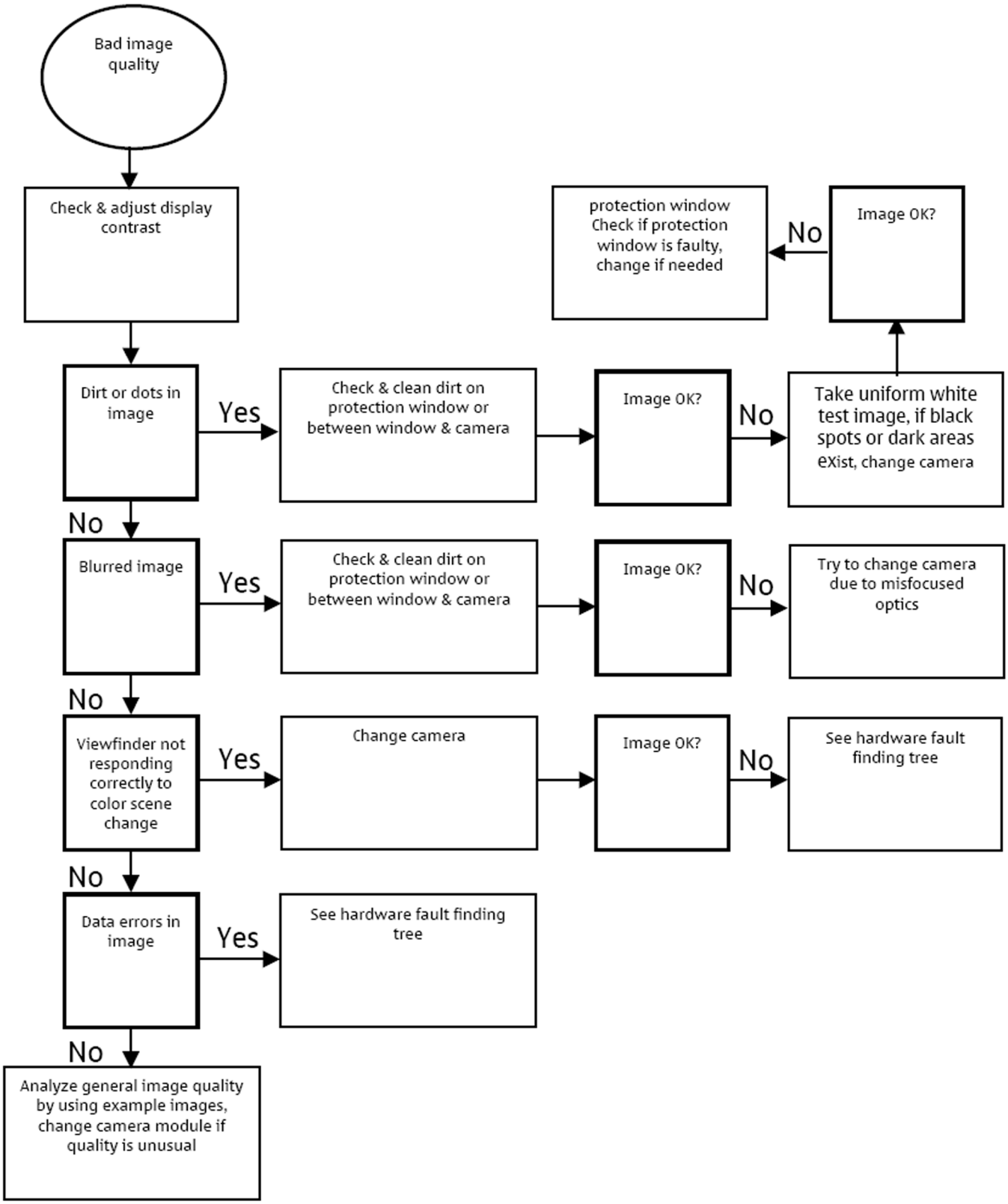
Front camera bad image quality troubleshooting

Troubleshooting flow



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9 — System Module

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Baseband description

System module block diagram

The device consists of two separate main modules: transceiver (1em) and Flip (1ff). The transceiver board consists of baseband and RF components.

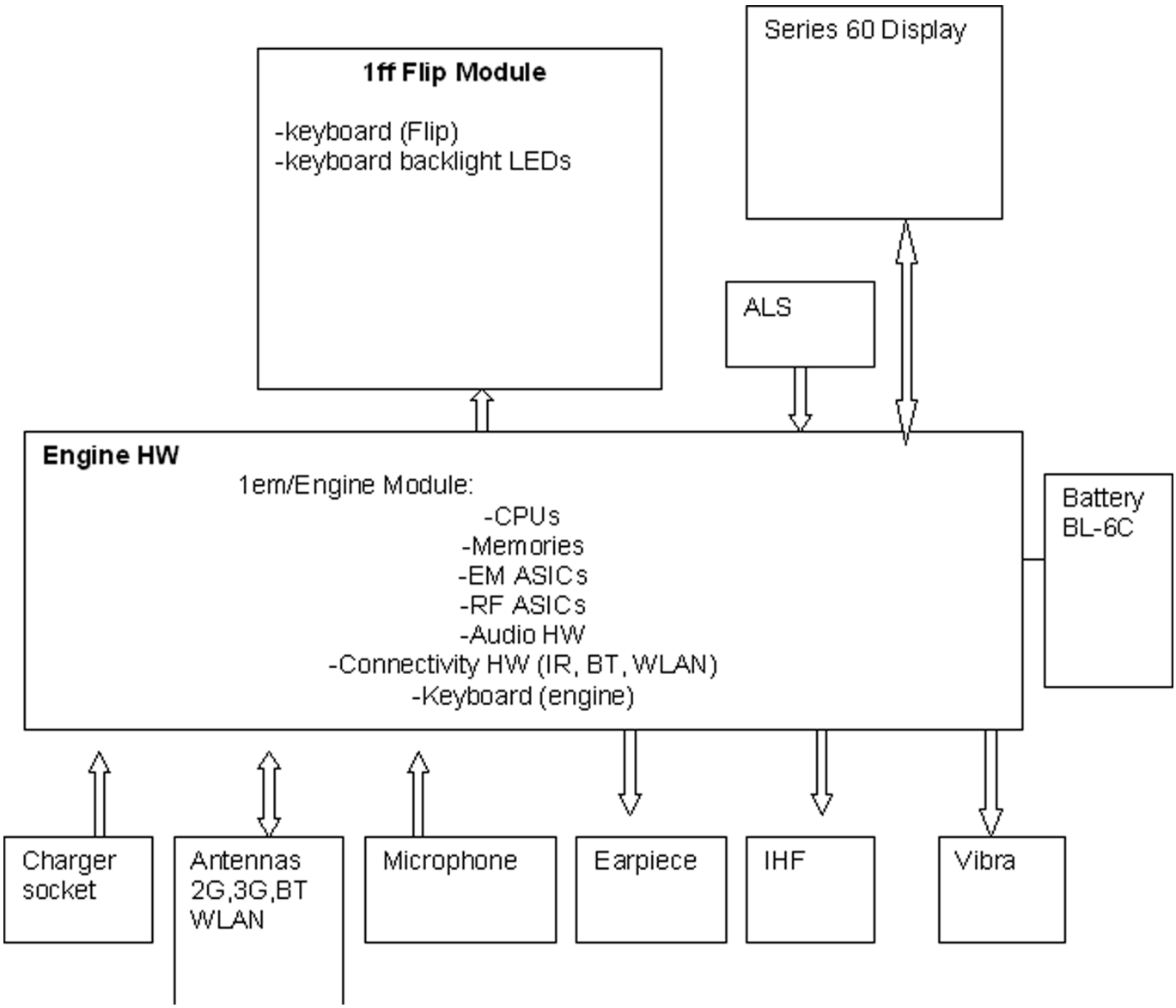

Figure 82 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and SYMBIAN based application sections. Modem functionality is in RAP and application processor acts as a platform for SYMBIAN applications.

Modem section consists of RAP ASIC with NOR FLASH and SDRAM memory as the core. RAP supports cellular protocols of WCDMA (3GPP R-4) and GSM (minimum EDGE glass 10, GPRS phase2). Modem SDRAM memory have 64Mbits of memory and NOR flash have 64Mbits of memory. RAP operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

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Application section includes the application processor ASIC with DDR/NAND combo memory as the core. Stacked DDR/NAND application memory has 512Mbits of DDR memory and 512Mbits of flash memory. The application processor uses 19.2MHz clock, which comes from the RAP divided by two from the 38.4 MHz system clock.

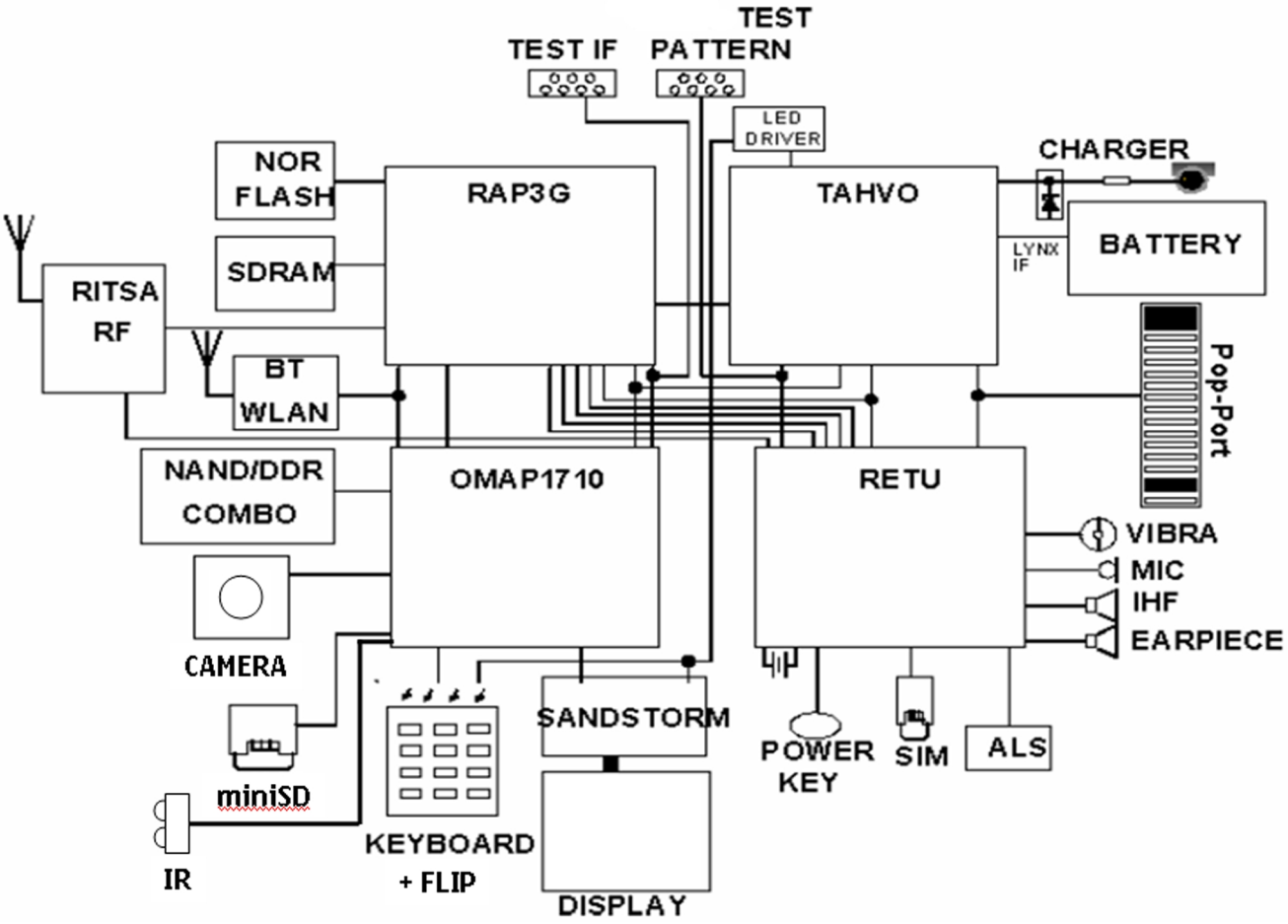

Figure 83 Functional block diagram

The application processor is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like display- and keyboard driver blocks.

Section	Description
Application processor	also called an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like display and keyboard driver blocks.
OMAP3.3	consists of ARM926 (MPU subsystem), TMS320C55x (DSP subsystem), DMA and OMAP3.3s internal peripherals.
MPU subsystem	based on an ARM926EJ. MPU is able to perform most of the application operations on the chip.
System DMA component	mainly used to help the MPU and DSP perform data memory transfer-specific tasks, leaving more available MIPS for both processors.

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Section	Description
DSP subsystem	based on a TMS320C55x™ DSP core, which is responsible for intensive data computing tasks like real-time audio and video handling on application side, e.g. voice recording.
Internal memory subsystem	composed of a single port SRAM.
Secure modules	These components enable the system to support secure applications.
Memory interfaces	The memory interfaces define the system memory access organization of application processor.
USB & modem interface	These two modules enable the platform to support a universal serial link and a dedicated modem interface.
System components	System components are group of modules responsible for managing system interactions such as interrupt, clock control and idle.
Peripheral subsystem	The peripheral subsystem defines all the components used to interface application processor with specific external devices such as camera, keyboard, display, etc.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+5.4	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+20V	V	
Back-Up supply voltage	0	2.5	2.7	V	Maximum capacity of the backup power supply assumed to be 4µAh. Do not heat the RTC backup capacitor over 260°C

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2200 master reset threshold.

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Mode	Description
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16 ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low. There are in principle three different sleep modes: • Application processor sleep • RAP sleep • Application processor and RAP sleep (deep sleep)
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, N2300's charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power on key is connected to N2200 ASIC via PWRONX signal.

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Power distribution

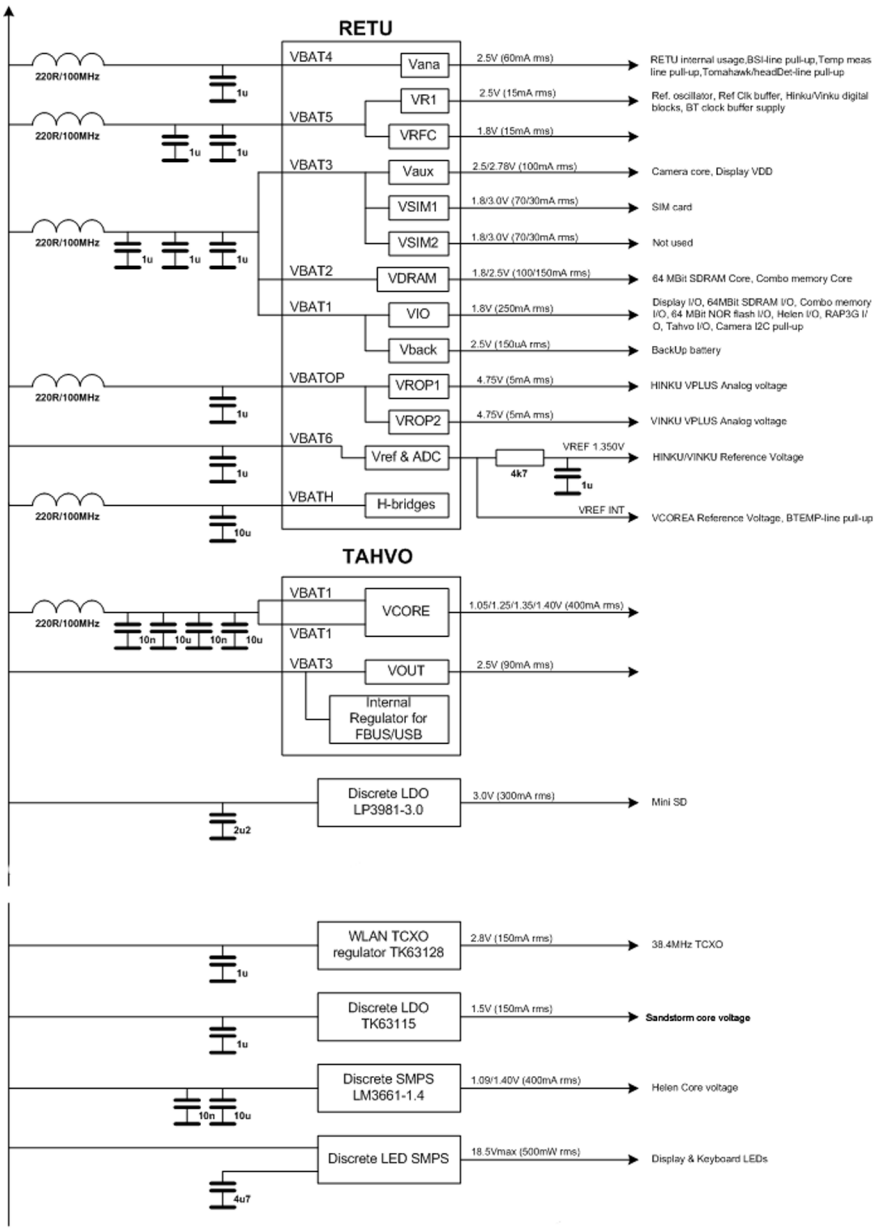

Figure 84 Power distribution diagram

Power supply components:

- EM ASIC (N2200)
- EM ASIC (N2300)
- Application processor VCORE SMPS
- BT
- LDO
- backlight SMPS

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASICs Hinku (Rx) & Vinku(Tx).

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Discrete power supplies are used to generate 2.8V to BT, 1.5V for the LCD controller voltage, 1.3V/1.5V for Application processor and 18V for the backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by EM ASIC (N2200) / VSIM1. EM ASIC (N2200) s VSIM2 is used to power RS MMC 1.8V only. USB accessories which needs power from the device are powered by EM ASIC (N2300) / VOUT.

Because LED driver in EM ASIC (N2300) is not used, the external SMPS is used instead. External LED SMPS is still controlled by EM ASIC (N2300) and powered by battery voltage.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. The data rate is regulated between the master and the slave.

The device Bluetooth is based on the TI BRF 6150 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system.

The PCM interface is used for audio data transfer between RAP and the BT system.

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

WLAN

STMicroelectronics STLC4370 implements 802.11b/g WLAN radio for embedded, low-power and small form factor mobile applications.

RFMD RF5924 Front-End Module (FEM) is a single integrated module. The FEM has integrated b/g power amplifier, power detector, RX balun and TX filtering.

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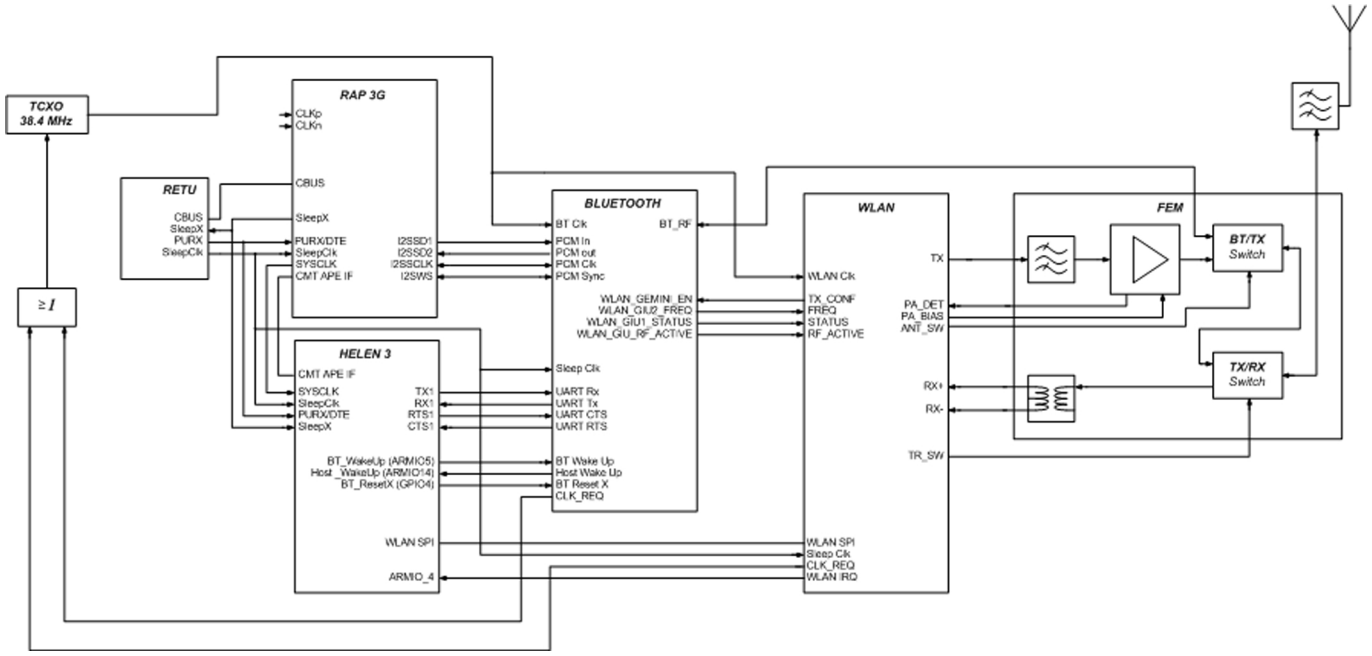

Figure 85 WLAN and BT block diagram

WLAN signals and interfaces

WLAN interface signals are listed in following table. These signals can be grouped to following categories: host interface 6 lines, clocking interface 3 lines, WLAN/BT coexistence interface 4 lines and power 2 lines.

The serial interface is connected to APE McBSP interface block.

WLAN/BT coexistence signaling interface (CXS) enables time shared operation of BT and WLAN transceivers so that the user perceives simultaneous operation of both systems.

Signal names in the table refer to RM-10/24 shematics pin names.

WLAN BB/MAC

The baseband chip implements OFDM/CCK digital baseband processor and ARM9-based MAC with internal SRAM memories.

Regulators

Switching stepdown regulator generates the MAC/BB digital core supply at 1.2 V.

Two separate LDOs at 1.8 V output supply the VCO and the transceiver. The main 1.8 V supply is used for transceiver analog parts, ADC/DAC and digital circuits inside the transceiver.

IrDA

IrDA specifies a low-cost, reliable, fully digital peer-to-peer data link between IrDA units at data rates from 9600 bits/s to 115 kbit/s. The link is based on the serial transmission of data as pulses of infra red light at the wave length of 870nm and angles of +-15degrees at the range 0 - 50 to 100 cm. Because these restrictions and the optical nature of the link, the transmission is not omnidirectional but focused and only reaches a peer at a limited line-of-sight distance from the transmitter thus not disturbing any other units in the neighbourhood.

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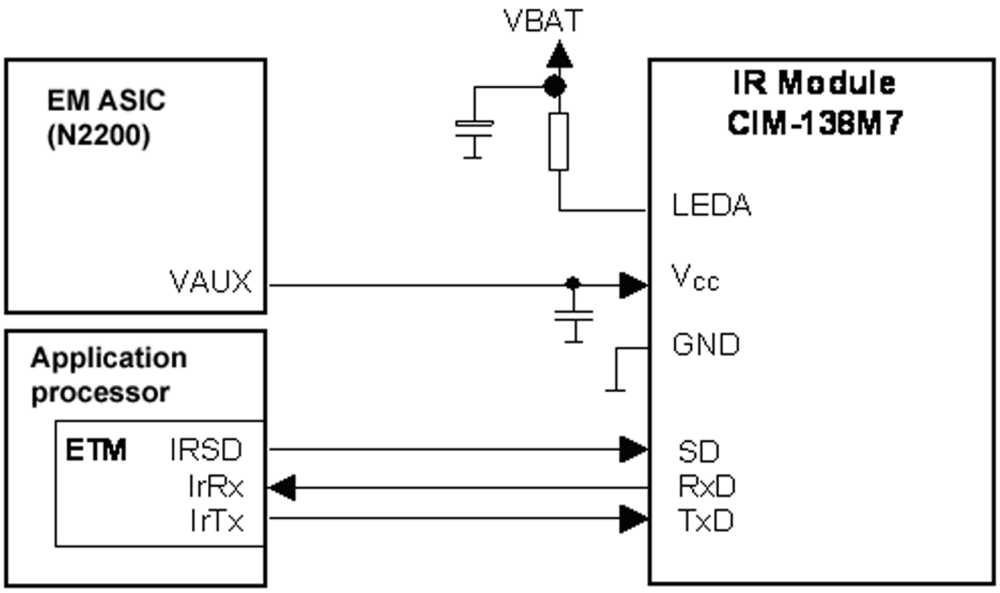

Figure 86 Interconnections between the application processor, power ASIC and IR module

Pin	Name	I/O (IR module)	Connection		Description
1	LEDA		Battery voltage VBAT		IR TX LED anode from VBAT through load resistor
2	TxD	I	Application processor	ETMPkt4	Transmit data input to IR Module
3	RxD	O	Application processor	ETMPkt3	Received data output from IR Module
4	SD	I	Application processor	ETMPkt1	Shut Down
5	VCC		EM ASIC (N2200)	VAUX	IR Module supply voltage, 2.5V, later 2.78V.
6	GND		GND		IR module Ground
7	GND		GND		Ground (only in lifting PWB)
8	GND		GND		Ground (only in lifting PWB)

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

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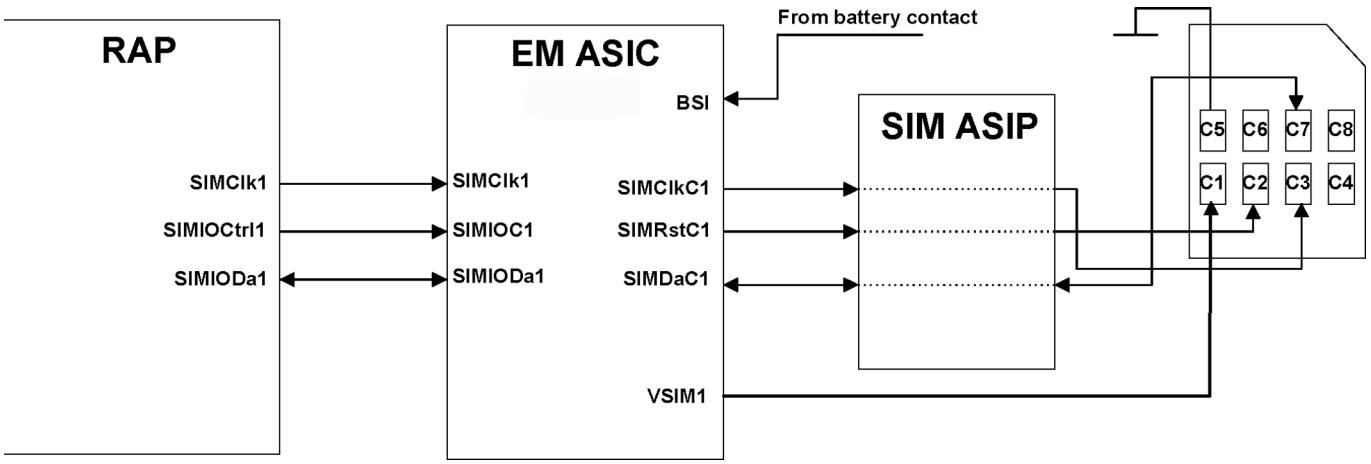

Figure 87 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM IF.

The EM ASIC SIM1 interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

MiniSD

The miniSD interface is compliant with The SD Memory Card Specification, Physical Layer Specification version 1.10.

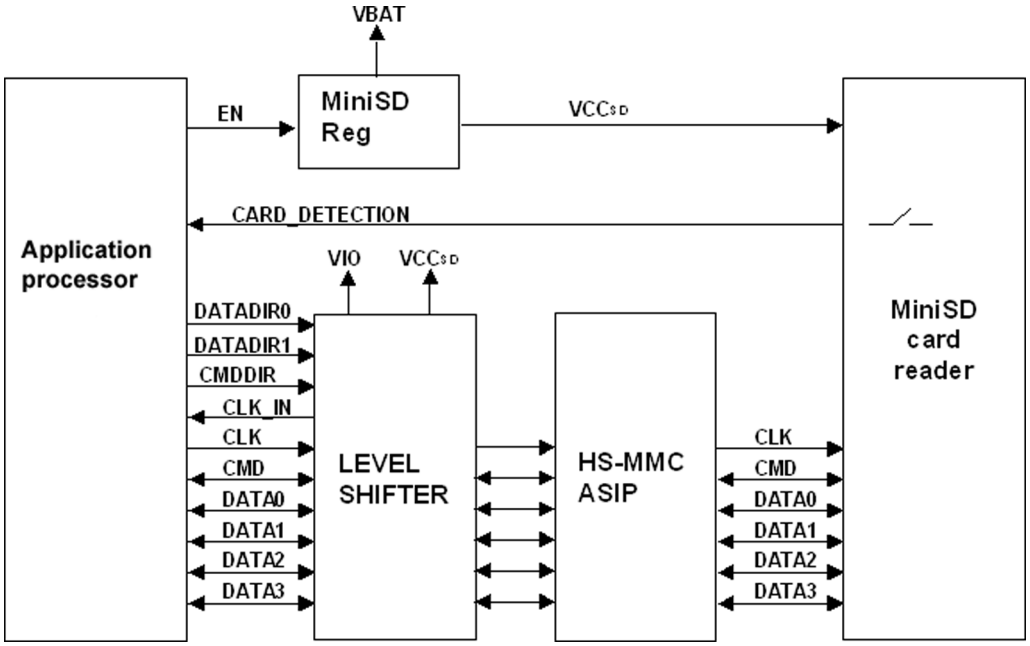

Figure 88 MiniSD interface block diagram

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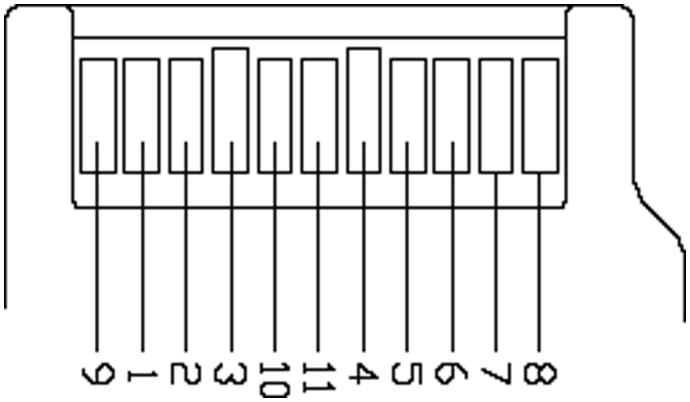

Figure 89 MiniSD contact area and pin order

Pin	Signal	I/O	Engine connection		Notes
Reader					
1	CD/DAT3		Application processor	MMC2_DAT3	Card Detect / Data Line [Bit 3]
2	CMD	<->	Application processor	MMC2_CMD	Command/Response
3	VSS1		GND		Ground
4	VDD	<-	Regulator	VCCSD	3.0V Regulator (Max 200mA)
5	CLK	<-	Application processor	MMC2_CLK	External clock for the miniSD card, Max 25 MHz
6	VSS2		GND		Ground
7	DAT0	<->	Application processor	MMC2_DAT0	Data Line [Bit 0]
8	DAT1	<->	Application processor	MMC2_DAT1	Data Line [Bit 1]
9	DAT2	<->	Application processor	MMC2_DAT2	Data Line [Bit 2]
10	NC				Not connected
11	NC				Not connected
		->	Application processor		Card detection switch
LS					
C2	10A2	->	Application processor	MMC2_CLKIN	Return clock
D1	9DIR	<-	Application processor	MMC2_CMDDIR	CMD direction
B4	1DIR	<-	Application processor	MMC2_DATDIR 0	Data direction 0

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Pin	Signal	I/O	Engine connection		Notes
A4	2DIR	<-	Application processor	MMC2_DATDIR 1	Data direction 1
REG					
	VEN	<-	Application processor	GPIO41	miniSD regulator enable
Misc.					
		->	Application processor		Battery cover switch

Battery interface

The battery interface supports the NMP battery interface for the BL-6C battery. This interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

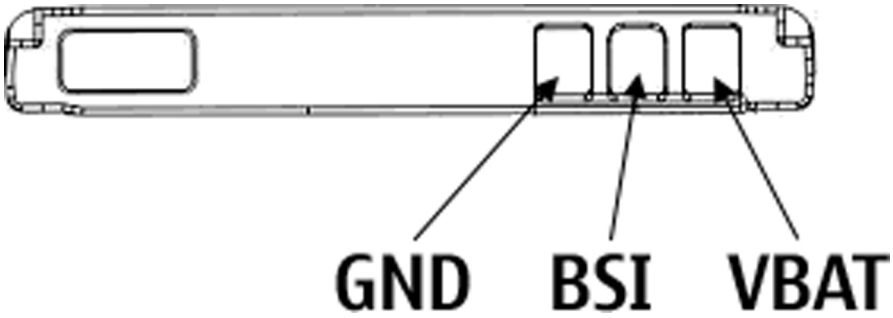

Figure 90 Battery pin order

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stabile.

The connection from the charger connector to the charger is established via a charger adaptor type CA-44.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

Table 12 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC (N2200)	VBAT	Battery voltage
2	BSI	->	EM ASIC (N2200)	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

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Table 13 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

Flip qwerty keyboard

Flip side of the QWERTY keyboard is connected to the application processor via separate microcontroller (COP8).

Engine side of the QWERTY keyboard is connected directly to the application processor pins. There are 6 rows and 7 coulumns in the engine qwerty key matrix.

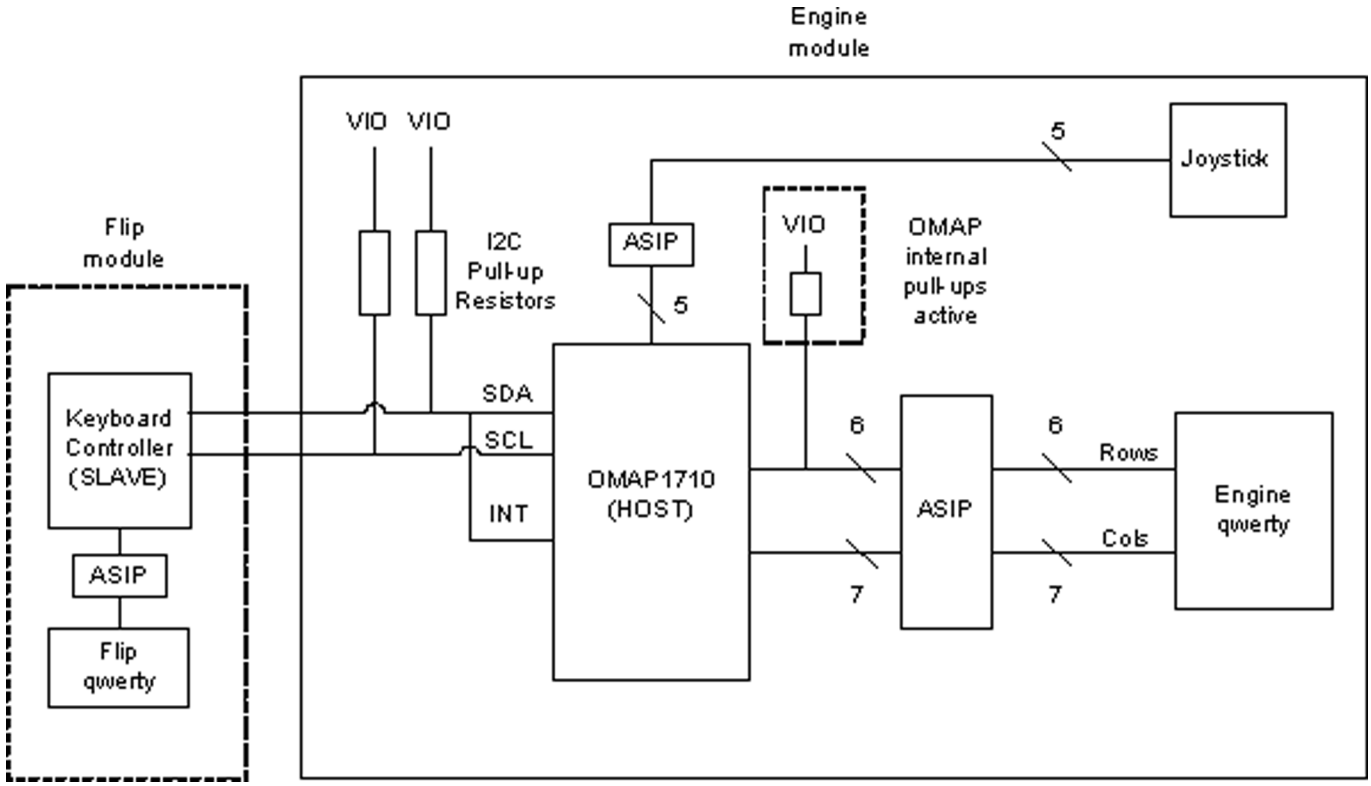

Figure 91 Block diagram

Test point		Notes
J4400	SDA	I2C bidirectional data
J4401	SCL	I2C clock
J4402	VBAT	Supply voltage for flip module

Test points

There are no testpoints for the engine side qwerty keyboard. There are three testpoints for the I2C interface between flip module and engine module.

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Table 14 Test points

Test point		Notes
J4400	SDA	I2C bidirectional data
J4401	SCL	I2C clock
J4402	VBAT	Supply voltage for flip module

Bluetooth RF

TI BRF 6150 ROM is a low power Bluetooth RF-tranceiver module meeting Bluetooth compatibility standards (Class 2 Bluetooth v1.2 compliant pre-qualified tranceiver system) and has the BTH/WLAN physical co-existence interface for Nokia application.

BRF 6150 is a single chip Bluetooth device appropriate for use in Nokia mobile phone applications, where the Nokia BB acts as a Bluetooth host interface.

Interface to RAP3G

The baseband uses RAP3G as the cellular ASIC and Helen3 as the Application processor.

This is because the BT application program runs on the Application processor in Symbian OS environment. Audio (PCM Interface) is still connected to the cellular ASIC such that cellular audio delay is kept minimum.

The Nokia BB and BRF 6150 interface can be logically divided into audio, user data and control Interfaces.

Audio interface

Audio data is transferred using a separate interface based on PCM (Sync, In, Out, Clk).

The interface is configured by MCU software but the data transfer is done by the DSP.

Audio data is based on 8kHz sampling data – same as that used in the cellular system. The used configuration is as shown below:

Master/Slave	TI as Slave
Clock	Nokia BB ASIC generates PCM_CLK
Data width	16 bits PCM_out
Sync. Frame	Short PCM_Sync
Coding	PCM Linear

WLAN interface CXS

Coexistence Signaling Interface [CXS] between BTH and WLAN modules is to facilitate collocation in a terminal that has BTH and WLAN.

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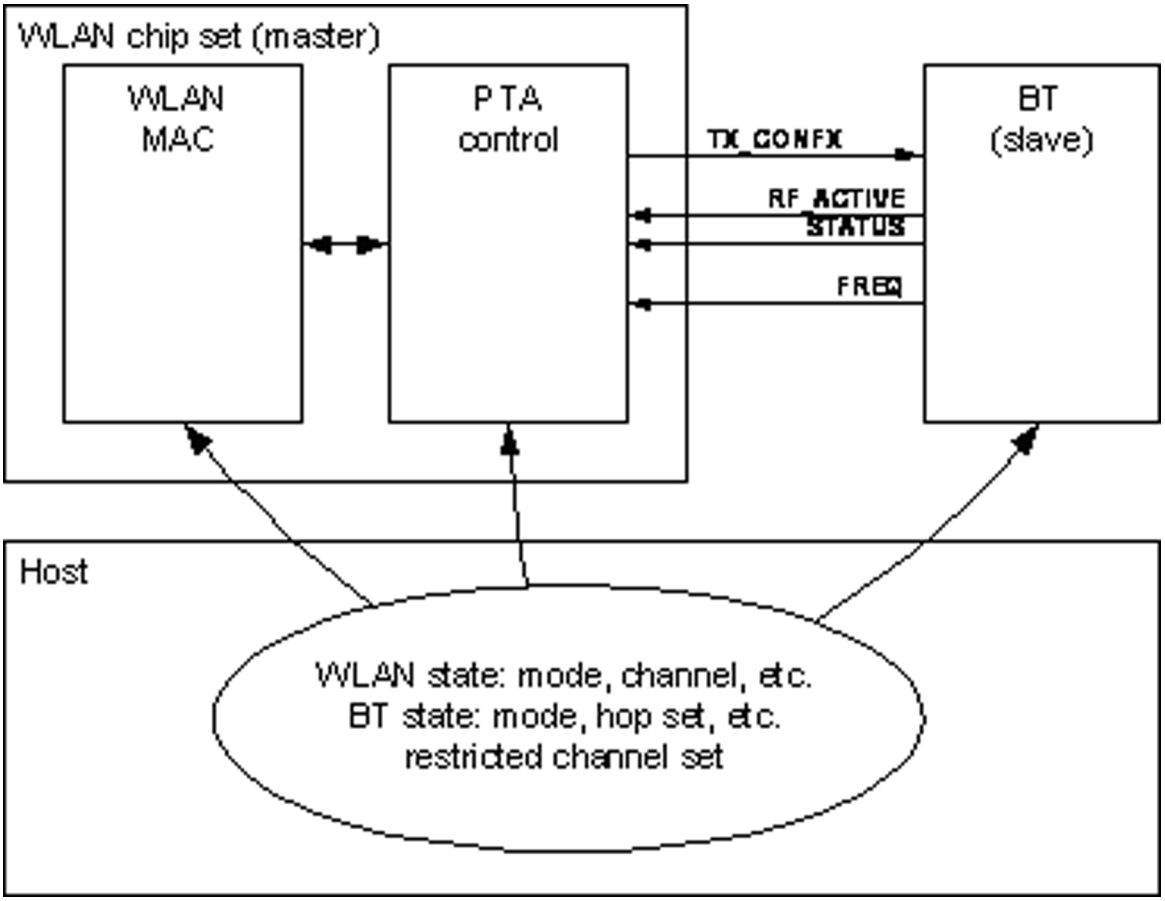

Figure 92 BT-WLAN coexistence framework

System partitioning

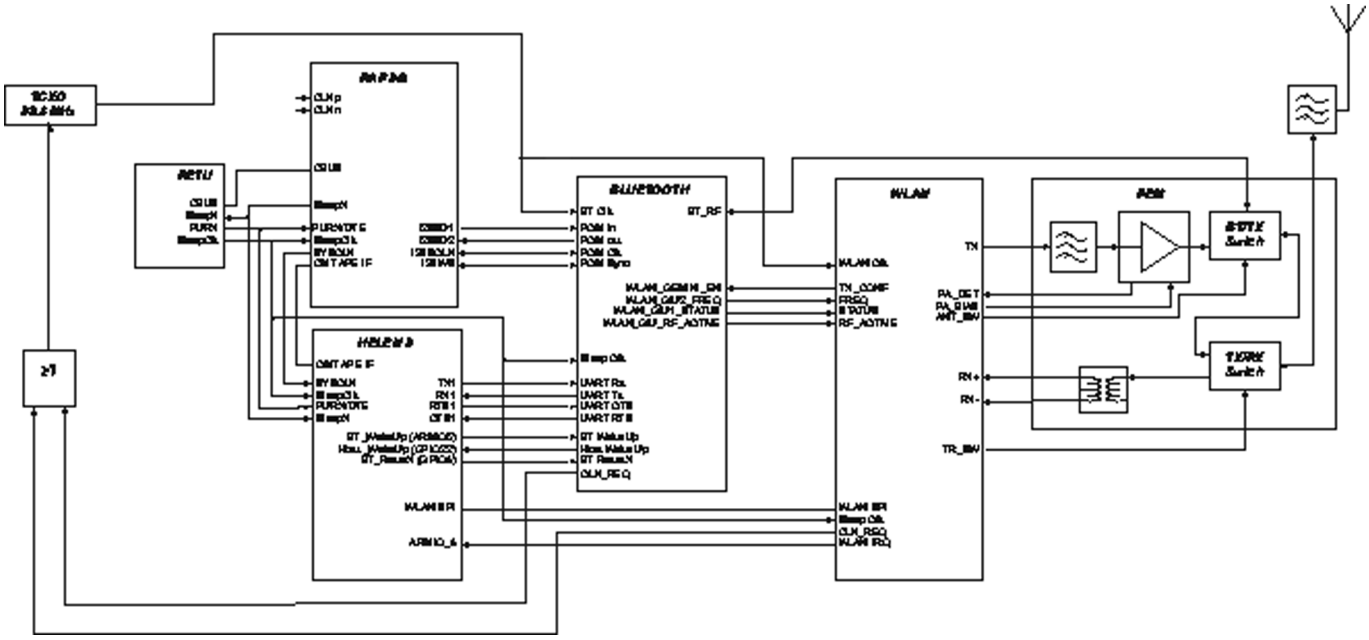

Figure 93 BT-WLAN system partitioning

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The interface between BRF 6150 and Nokia BB assumes that all higher layers above the HCI (host controller interface) are implemented in Nokia BB and all other layers (BB, Link Manager, Link Control, and component RF) below the HCI are implemented in BRF 6150.

Clock signals

BRF 6150 requires a system clock, which it uses to derive all its internal timing. The clock may be sinusoidal or square and the frequency tolerance is +/-20 ppm. The external TCXO clock oscillator is used for the system clock with a sinusoidal output.

SD card

SD card is supplied with 3V supply voltage. The detection of SD card removal/insertion is done by a switch in the card connector.

Removing SD card while writing to card may corrupt data in SD card. Switch is directly connected to host and it gives an interrupt to the SW while the status of the switch is changed.

User interface

Display interface

Display features:

- Up to 16M colors within 352 x 416 pixels
- Partial display function Power saving by pausing display process on part of the screen.

The display has two different operating modes:

1 Normal mode, Full screen, up to 16M colours

2 Partial mode, 260k colors but only part of the display is active with 8 colours

The display module does not require any tunings in service.

Keyboard

Joystick

The joystick has one dome for select and four springs for directions. When any direction is selected there are always select and two direction switches connected.

Flip Keyboard

So called T9 keyboard and left side of qwerty keyboard are implemented in flip. VBAT is supplied to flip via load switch.

Data between the flip and engine is transferred thru I2C interface. Three coaxial cables are used in flip engine connection.

Flip Keyboard Interface Signal Description

Table 15 Flip keyboard interface signals

Pin	Signal	I/O	Engine connection		Notes
1	Flip Vcc	<-	LOAD SWITCH		VBAT after load switch
2	Flip data	<->	Application processor	scl	I2C data

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Pin	Signal	I/O	Engine connection		Notes
3	Flip clock	<->	Application processor	sda	I2C clock
	GND		GND		Flip ground

Display and keyboard backlight

The device has one LED Driver (SMPS) that is used to drive display and SW keys.

Both display LEDs (4pcs) and keyboard LEDs (2pcs) are connected in series.

Current adjustment of the driver is done from the display LED branch, and keyboard current also depends on the display brightness.

In a typical use case, keyboard LEDs are turned ON only in dark ambient lighting conditions.

ALS interface

Ambient Light Sensor (ALS) is located in the upper part of the phone. It consists of the following components:

- lightguide (part of the front cover)
- phototransistor (V4400) + resistor (R4401)
- NTC + resistors (R4400, R4402, R4403)
- EM ASIC (N2200)

Information on ambient lighting is used to control the backlights of the phone:

- Keypad lighting is switched on only when the environment is dark / dim
- Display backlights are dimmed, when the environment is dark / dim

The ambient light sensor itself is a photo transistor, which is temperature-compensated by an external NTC resistor. N2200 reads the light sensor (LS) and temperature (LST) results.

ALS calibration is not possible in the service points. ALS is serviced by replacing faulty phototransistors.

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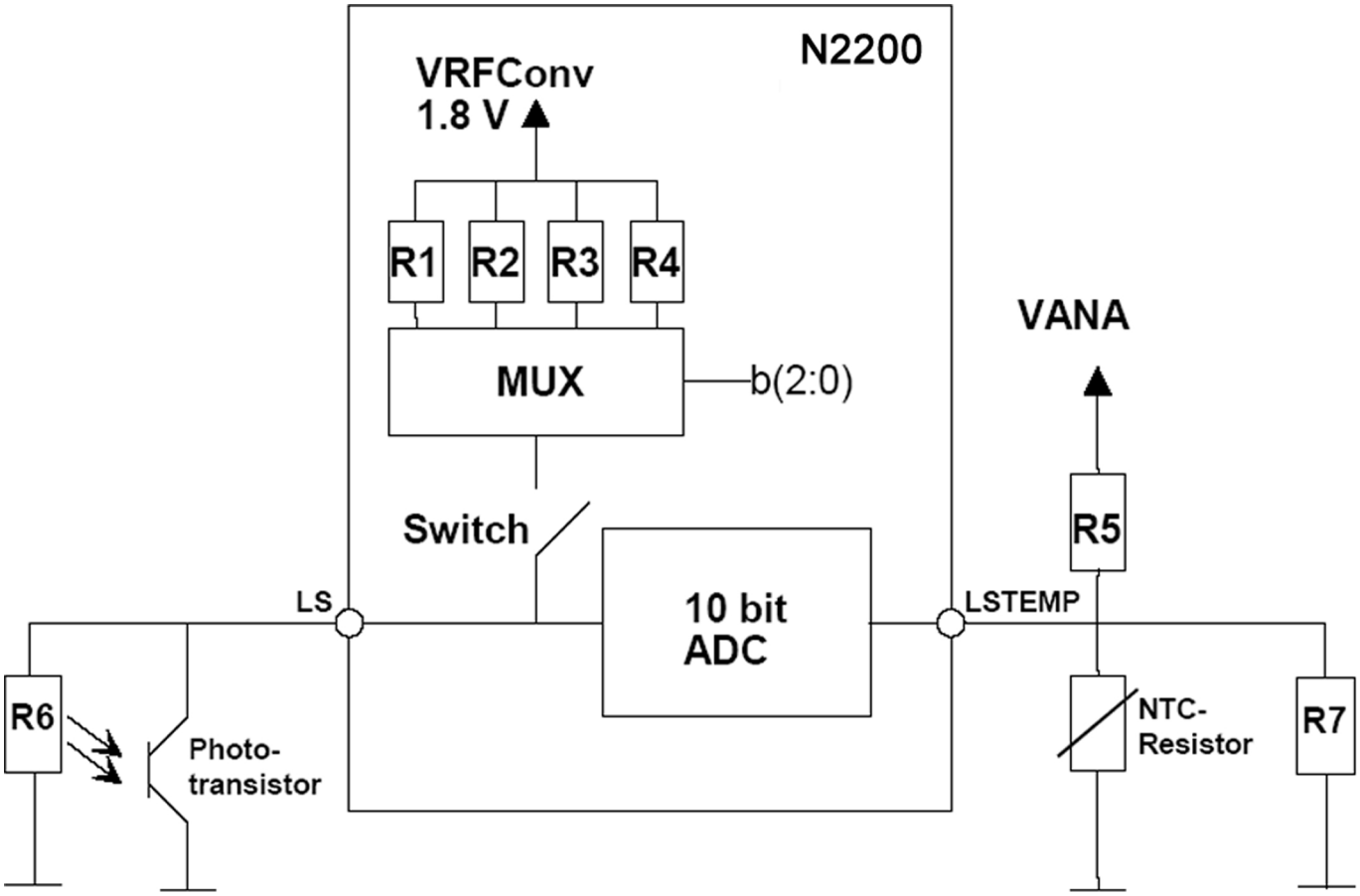

Figure 94 ALS HW implementation

Table 16 ALS resistor values

Symbol	R1	R2	R3	R4	R5	R6	R7	NTC-res
Value	5 kOhm	15 kOhm	30 kOhm	50 kOhm	470 kOhm	100 kohm	470 kohm	47 kOhm

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor.

In general RAP consists of three separate parts:

- Processor subsystem (PSS) that includes the main processor and related functions
- MCU peripherals that are mainly controlled by MCU
- DSP peripherals that are mainly controlled by DSP

RAP core voltage (1.4 V) is generated from the EM ASIC (N2300) VCORE and I/O voltage (1.8 V) is from the EM ASIC (N2200) VIO. The core voltage in sleep mode is 1.05 V.

EM ASIC N2200

EM ASIC N2200 includes the following functional blocks:

- Start up logic and reset control
- Charger detection

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- Battery voltage monitoring
- 32.768 kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

EM ASIC N2300 includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- External LED driver control interface
- Digital interface (CBUS)
- Accessory supply voltage regulator
- Vout - accessory

Device memories

RAP memories NOR flash and SDRAM

The modem memory consists of 64 Mbit SDRAM and 64 Mbit NOR flash memories.

SDRAM is a dynamic memory for ISA (Intelligent Software Architecture) SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbit of DDR memory and 1024 Mbit of flash memory.

Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAP CMT engine ASIC and the mixed-signal ASIC.

The mixed-signal ASIC provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into the ASIC, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

There are three audio transducers:

- 8 mm dynamic earpiece
- 16 mm dynamic speaker
- electret microphone module

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In addition to the audio transducers, the mixed-signal ASIC also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the system connector.

A Bluetooth audio module, which is connected to the RAP ASIC supports Bluetooth audio functionality.

There is also a separate application ASIC for Symbian applications.

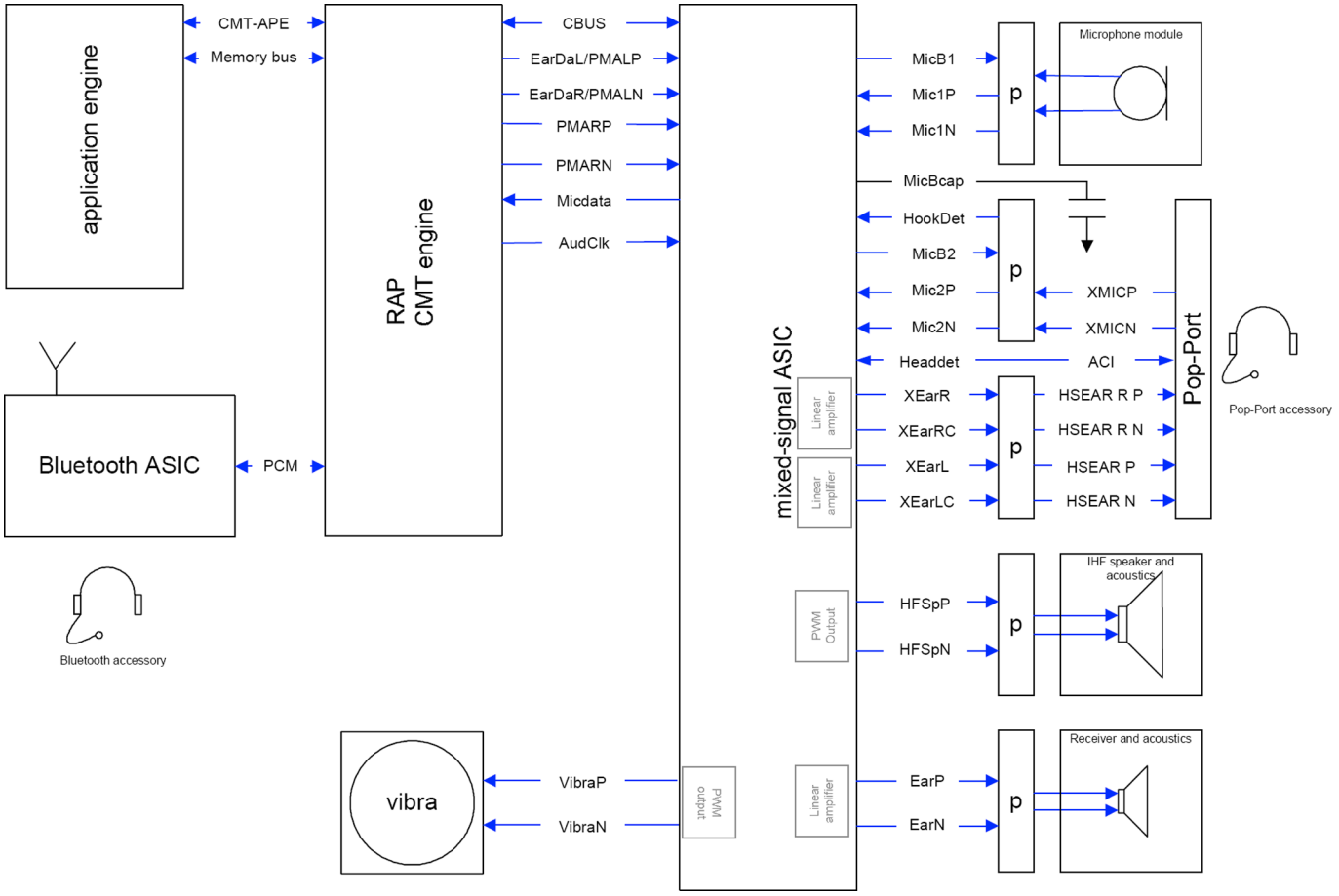

Figure 95 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to N2200 Mic1P and Mic1N inputs via asymmetric electrical connection.

The microphone is biased by N2200 MicB1 bias voltage output.

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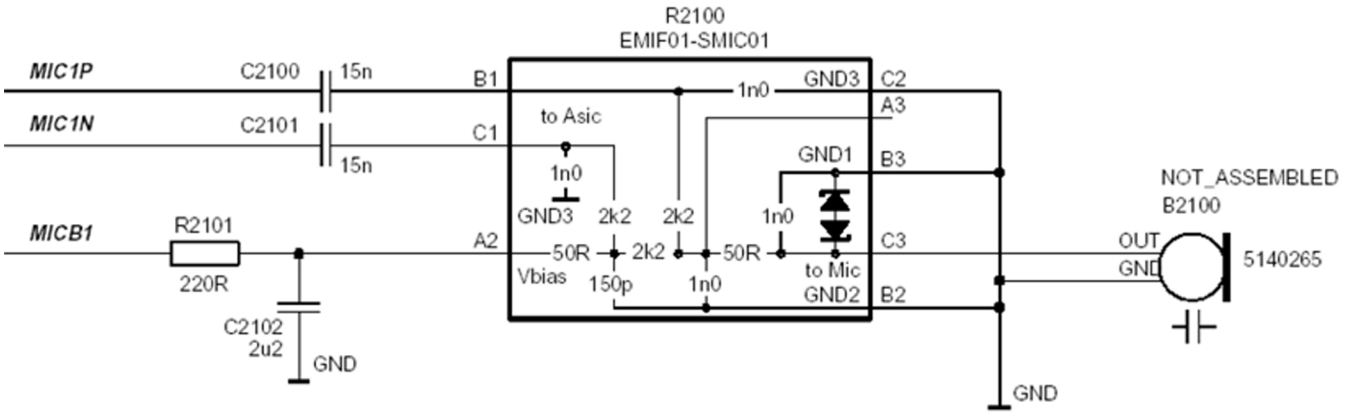

Figure 96 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

External microphone circuitry is biased by N2200 MicB2 bias voltage output. The circuitry provides a symmetrical connection for the microphone from the system connector connections, XMICN and XMICP, to N2200 inputs, Mic2P and Mic2N.

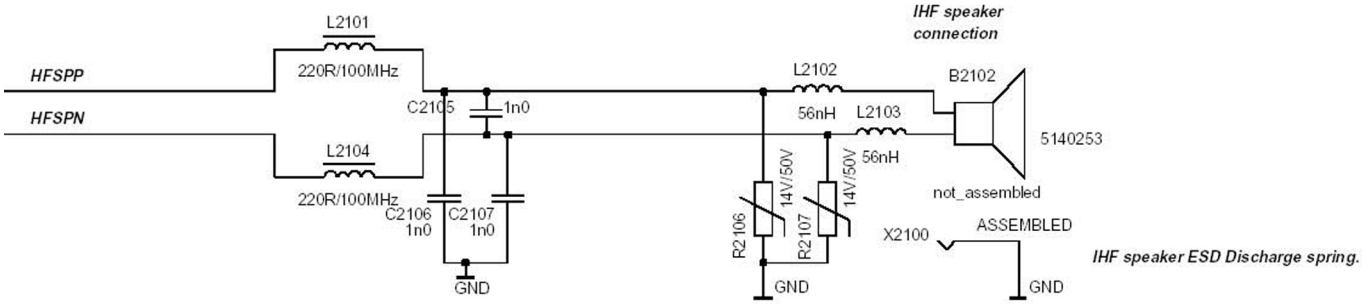

Figure 97 External microphone circuitry (Pop-Port™ connects to the right side)

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 8 mm earpiece capsule is connected to N2200 differential outputs EarP and EarN.

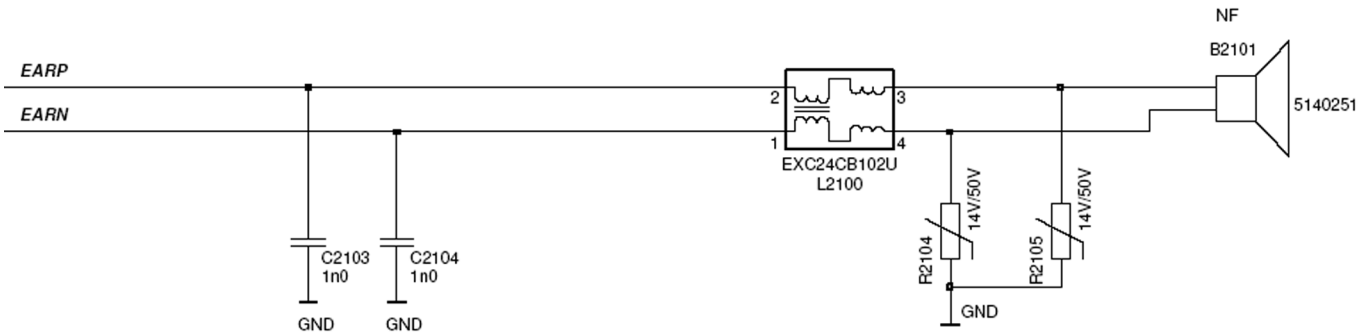

Figure 98 Internal earpiece circuitry

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Internal speaker

The internal speaker is used in Internal HandsFree (IHF) call mode.

A dynamic 16 mm speaker is connected to N2200 outputs HFSpP and HFSpN.

The IHF amplifier integrated in N2200 is a Digital Pulse Modulated Amplifier (DPMA).

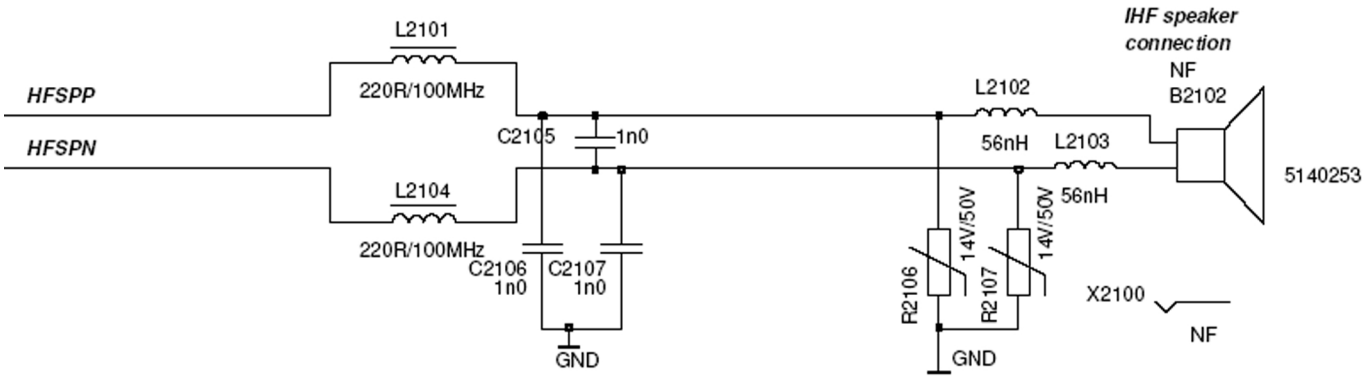

Figure 99 Internal speaker circuitry

External earpiece

All galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

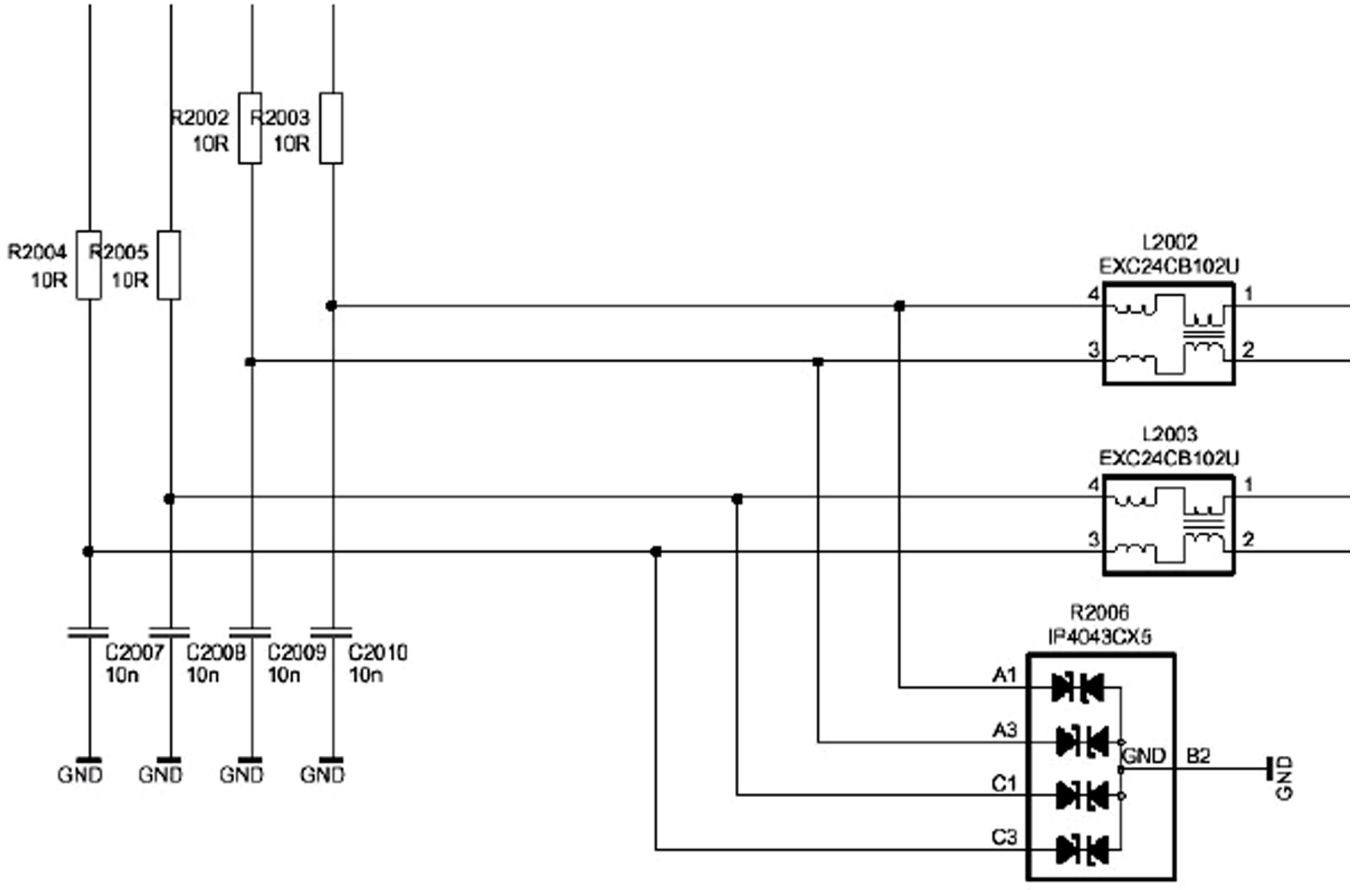

Figure 100 External earpiece circuitry (system connector connected on the right)

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Vibra circuitry

The vibra circuitry is used for the vibra-alarm function.

The vibra motor is connected to the EM ASIC (N2200) VibraP and VibraN Pulse Width Modulated (PWM) outputs.

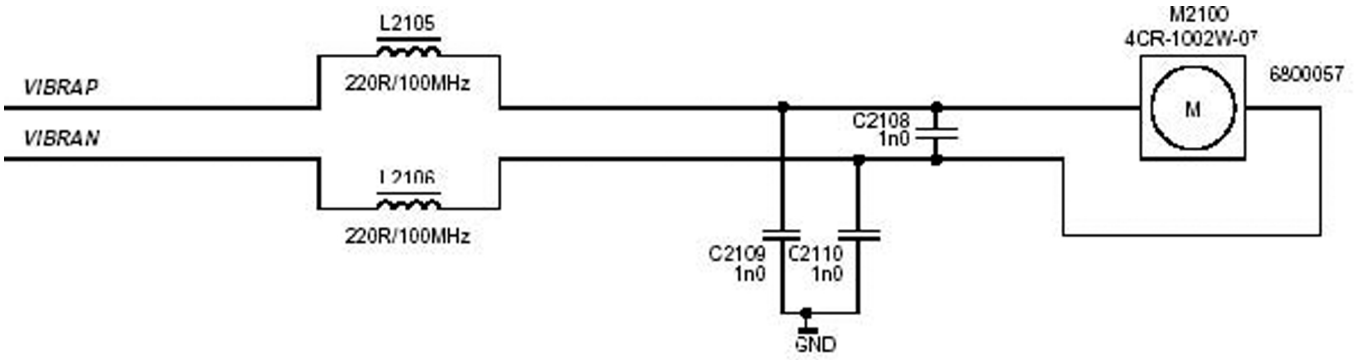

Figure 101 Vibra circuitry

System connector

System connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in EM ASIC (N2200) is meant for the headset.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

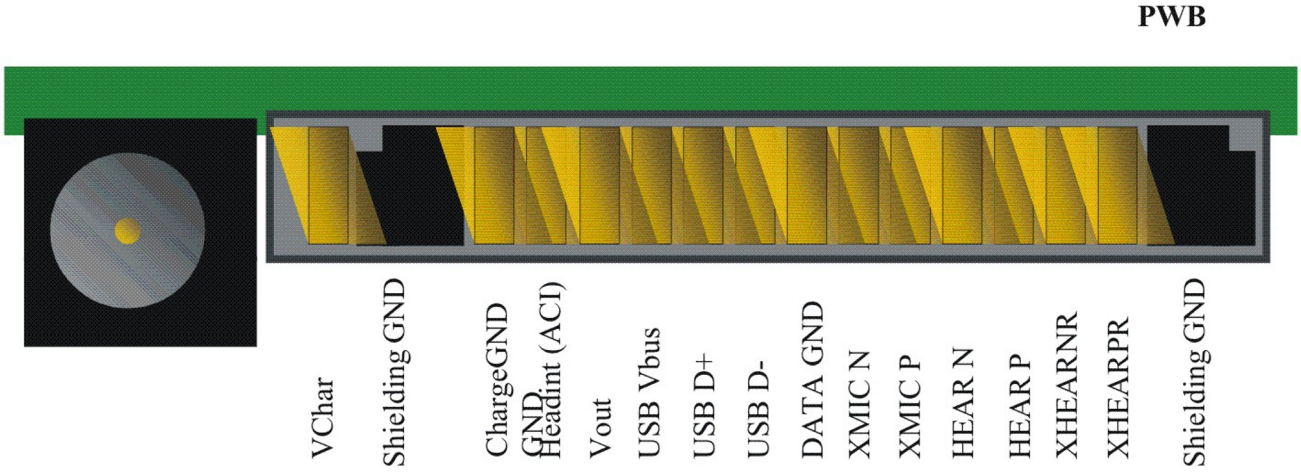

Figure 102 External audio connector

Table 17 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection

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Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
11 / HEAR N	Audio out	20-20k	1Vpp	10Ω	
12 / HEAR P	Audio out	20-20k	1Vpp	10Ω	
13 / HEAR R N	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono
14 / HEAR R P	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2001
Charger	X2000
Headset	X2001
SIM	X2700
Mini SD	X5200
Battery connector	X2070

Headset hook detection interface (XMICN) electrical characteristics

Description	Min	Typ	Max	Unit	Notes
Hook detection threshold 1	1.25	1.35	1.45	V	Two fixed thresholds inside N2200. Selectable by SW
Hook detection threshold 2	0.5	0.6	0.7	V	
Hook detection hysteresis		25		mV	
Hook detection pull ups	1	2	4	uA	

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Audio signal electrical characteristics

Description	Parameter	Typ	Unit	Notes
XMIC N	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
XMIC P	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
HSEAR N	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR P	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR R N	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono
HSEAR R P	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	N2200	VSIM1	Supply voltage to SIM card, 1.8 V or 3.0 V.
C2	SIMRST	Out	N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	N2200	SIM1DaC	Data input / output

RS MMC interface connections

Pin	Signal	I/O	Engine connection		Notes
1	RSV		NC	NC	Reserved for future use
2	CMD	<->	D4800	MMC2_CMD	Command/ Response
3	Vss1		GND		Ground

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Pin	Signal	I/O	Engine connection		Notes
4	V_{DD}	<-	N2200	VSIM2	VSIM2, supply voltage 1.8 (Max 70mA)
5	CLK	<-	D4800	MMC2_CLK	External clock for the MMC card, Max 20 MHz
6	Vss2		GND		Ground
7	DAT	<->	D4800	MMC2_DAT0	Bi-directional data bus
-	MMCDET	->	D4800	btwake1(in) [P10]	MMC card detect

Charger connector and charging interface connections & electrical characteristics

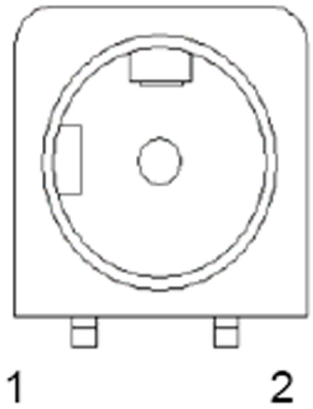

Figure 103 Charger connector

Table 18 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 19 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	

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Description	Parameter	Min	Max	Unit	Notes
Threshold for charging, rising (N2300)	V_{MSTR+}	2.1		V	Typical value
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

Internal interfaces

Name of Connection	Connector reference	Notes
Display	X4401	
Camera	X1470	Mirage 2X
ALS	V4410	Ambient Light Sensor
Vibra	M2100	
Microphone	B2100	
Earpiece	B2101	
IHF speaker	B2102	
Flip	X4402	

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Display connector and interface connections

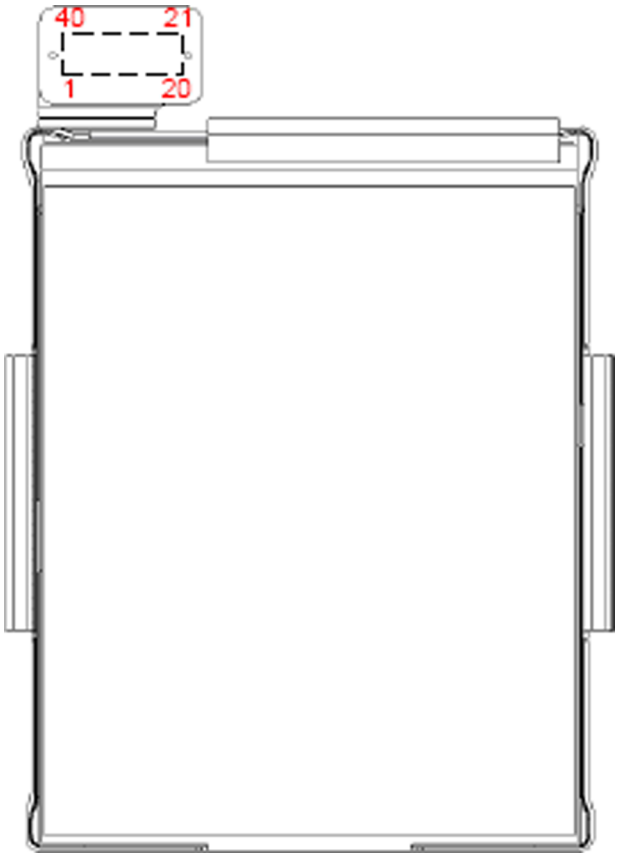

Figure 104 Display connector pin order (top view)

Table 20 Display module electrical interface signals

Display Pin No	Display	I/O	Engine Connection		Description
	Signal Name				
1	XRES	<-			Reset,active low
2	HS	<-			Horizontal sync.
3	VS	<-			Vertical sync.
4	D17 (R5)	<-			Data bus
5	D15 (R3)	<-			Data bus
6	GND		GND		Ground
7	D13 (R1)	<-			Data bus
8	D11 (G5)	<-			Data bus
9	D9 (G3)	<-			Data bus
10	D7 (G1)	<-			Data bus
11	GND		GND		Ground
12	D5 (B5)	<-			Data bus

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Display Pin No	Display	I/O	Engine Connection		Description
	Signal Name				
13	D3 (B3)	<-			Data bus
14	D1 (B1)	<-			Data bus
15	SCL	<-			Serial clock
16	GND		GND		Ground
17	VDDI	<-			Supply voltage for logic (1.8V)
18	VDD	<-			Supply voltage (2.5/2.78V)
19	GND		GND		Ground
20	LEDIN				LED current source
21	LEDOUT				LDE current sink
22	GND		GND		Ground
23	XCS	<-			Chip Select
24	DOUT	->			Serial data
25	DIN	<-			Serial data
26	D0 (B0)	<-			Data bus
27	D2 (B2)	<-			Data bus
28	GND		GND		Ground
29	D4 (B4)	<-			Data bus
30	D6 (G0)	<-			Data bus
31	D8 (G2)	<-			Data bus
32	GND		GND		Ground
33	D10 (G4)	<-			Data bus
34	D12 (R0)	<-			Data bus
35	D14 (R2)	<-			Data bus
36	D16 (R4)	<-			Data bus
37	GND		GND		Ground
38	PCLK	<-			Pixel clock
39	GND		GND		Ground
40	DE	<-			Data Enable

Display connector

Products requiring a rotated display image can take advantage of the SwivelView™ feature which provides hardware rotation of the display memory transparent to the software application.

Resolutions supported include 800x480 single buffered and 352x416 double buffered.

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Back-up battery interface connections and electrical characteristics

Table 21 Back-up battery connections

Pin name	I/O	Connection	Notes
VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200

Table 22 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Introduction to receiver functionality

Receiver functions are implemented in an RF ASIC.

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

WCDMA receiver functionality

In the WCDMA mode, the received signal is fed from the antenna to a duplex filter. After the duplex filter the signal goes via a balun to an LNA (Low Noise Amplifier) residing in N7500. From the LNA, the signal goes trough a band pass filter.

After filtering, the signal goes to the down conversion mixer, which converts the signal to baseband I and Q signals. At the BB frequency the signal is amplified, and fed to a low pass filter. The Rx channel filter must be calibrated with an automatic routine whenever the Rx ASIC IC is changed to a phone.

In the WCDMA mode, the corner frequency of the filter is set to approximately 2.1 MHz. The filter is followed by an AGC (Automatic Gain Control) amplifier with an adjustable gain. The signal is further amplified before it is fed to balanced analogue IQ output pins. The analogue output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in the BB ASIC RAP.

The last stage of the RF Rx chain is an output buffer which feeds the signal and a reference voltage (VREFCM) to the BB ASIC.

GSM receiver functionality

As GSM Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module.

The antenna switch module is followed by integrated LNAs residing in the Rx ASIC.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

After the down conversion mixer, the Rx chain is similar to the WCDMA Rx. The channel select filter is set to 115 kHz in the GSM mode.

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Introduction to transmitter functionality

Transmitter functions are implemented in an RF ASIC. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

In addition, the ASIC contains separate RF paths comprising a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter functionality

In the transmitter side, an analogue I/Q modulated signal is received from digital baseband into an RF ASIC and fed through a low pass filter. After the filter the signal is fed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators: one for WCDMA and another for GSM signals. The signal then exits the RF ASIC via a balanced line. Next, the signal is band pass filtered by a SAW filter before it is fed to the WCDMA PA module. After the PA, the transmitted WCDMA signal is fed through an isolator and a duplex filter to the antenna.

WCDMA power control

WCDMA Tx power control is accomplished by the two VGA amplifier stages in the Tx ASIC.

The VGAs have a common temperature compensation circuit and one voltage mode analogue input for gain control (TXC).

Another function of the detector voltage is to steer the DC/DC converter, which is providing a variable supply voltage for the WCDMA PA.

WCDMA PA module

The WCDMA PA is housed in a separate module having:

- a variable supply voltage input for the amplifier stages (Vcc11),
- a battery supply voltage for the bias circuits (Vcc12),
- and two bias current inputs.

Bias currents are generated by 5-bit DA converters in the RF ASIC.

If a different manufacturer's PA is changed to the phone, this setting must be set again.

PA DC/DC converter

The control of the DC/DC converter is fed back from the power detector circuit.

GSM transmitter functionality

An RF ASIC receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator.

After the VGA stage the signal exits the RF ASIC. In case of GSM1800/1900 the signal goes directly to the GSM PA module. In case of EGSM900 (and GSM850), the PA module is preceded by a SAW filter. After the filter, the signal is fed to the GSM PA module. Finally, the signal is routed via the antenna switch to the antenna.

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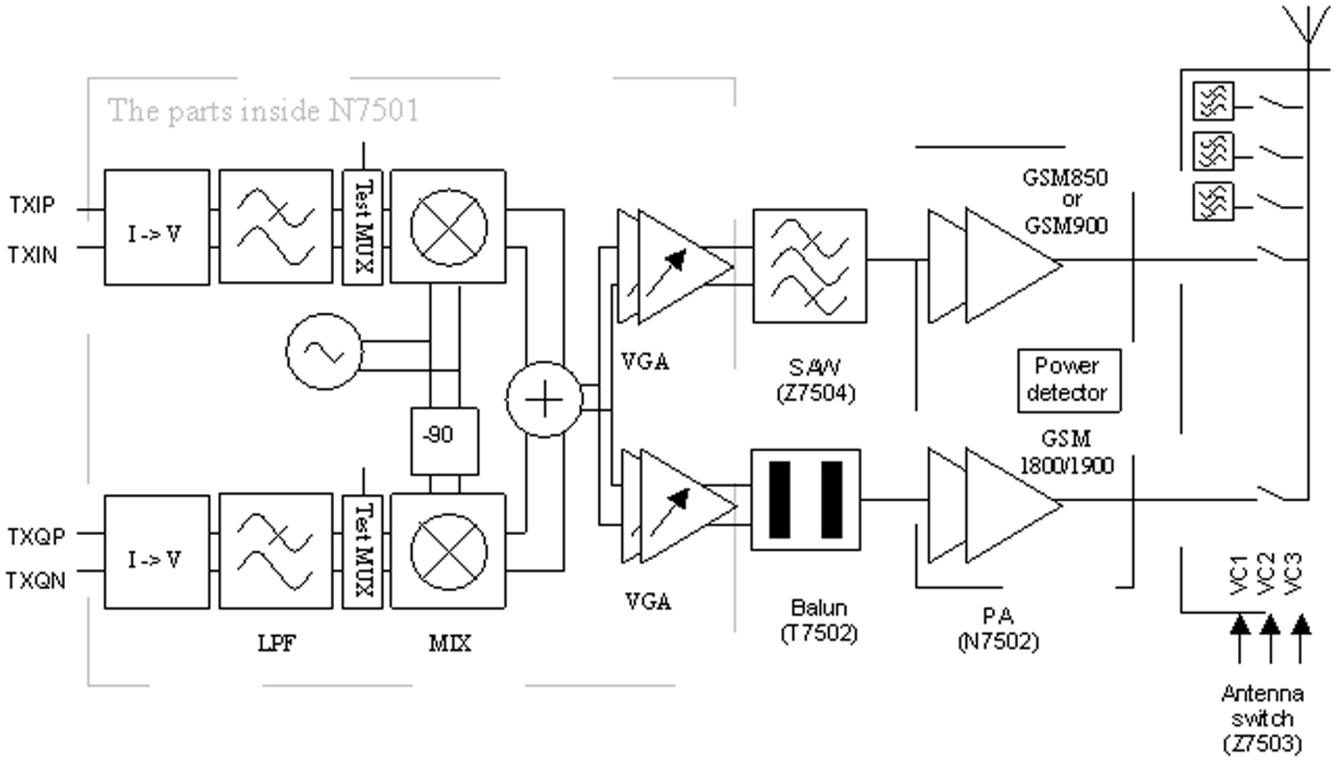

Figure 105 GSM transmitter

GSM power control

A closed control loop comprise an integrated power detector (in PA module) and an error amplifier. The error amplifier resides in N7501, and it controls the transmitter power of GSM.

GSM PA module

A single GSM/EDGE PA module contains two separate amplifier chains, one for EGSM900 (and GSM850) and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF has separate synthesizers for Rx and Tx. Both synthesizers consist of:

- PLL (Phase-Locked Loop)
- loop filter
- VCO (Voltage Controlled Oscillator)
- balun

The VCO frequencies are locked by PLLs into a reference oscillator, VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBus.

Reference oscillators

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

Regulators

RF ASICs contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts. Rx VCO supply is got via a switch from an RF ASIC VR1 regulator.

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Frequency mappings

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

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GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

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GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

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WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

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WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

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10 — Schematics

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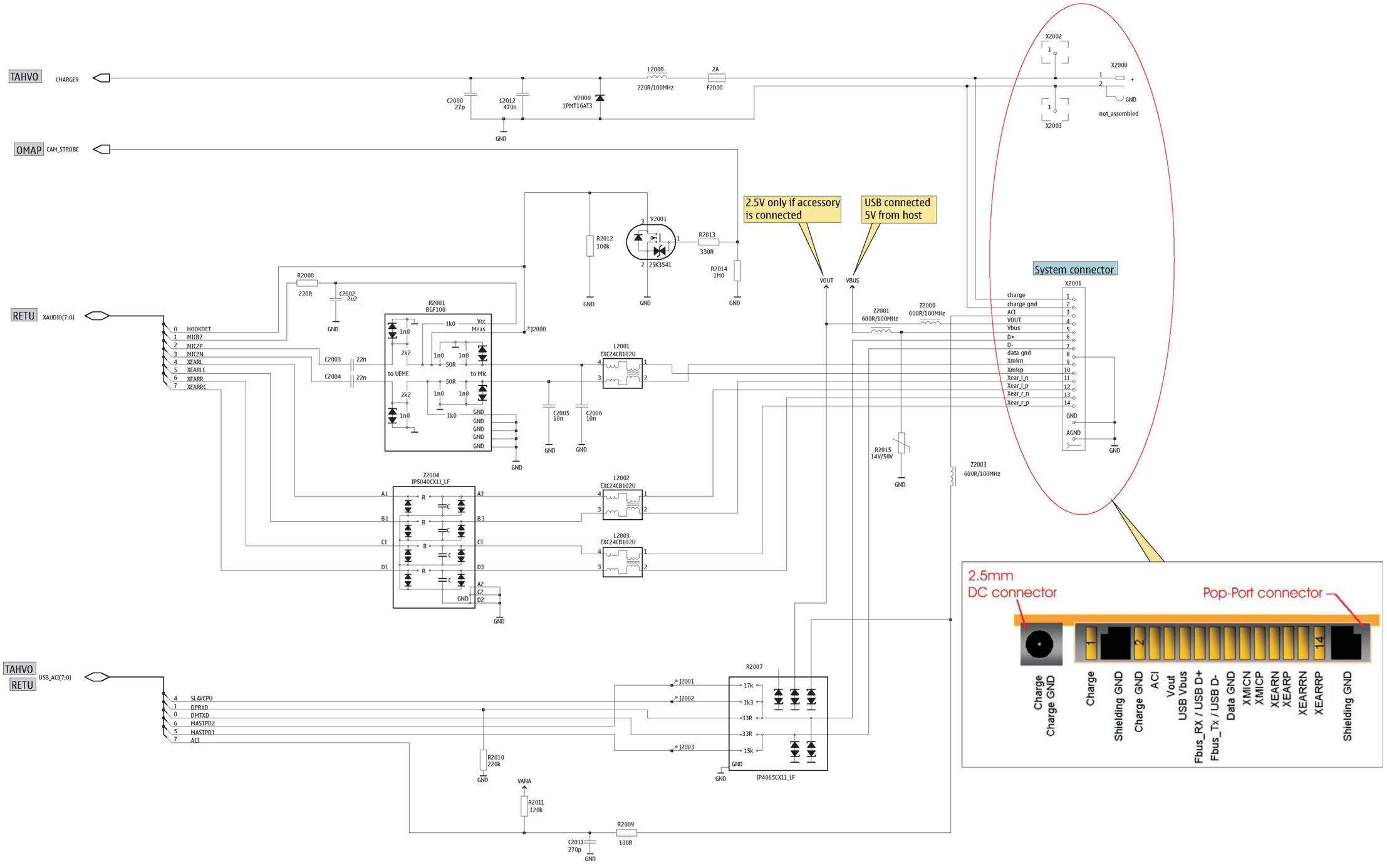
System connector



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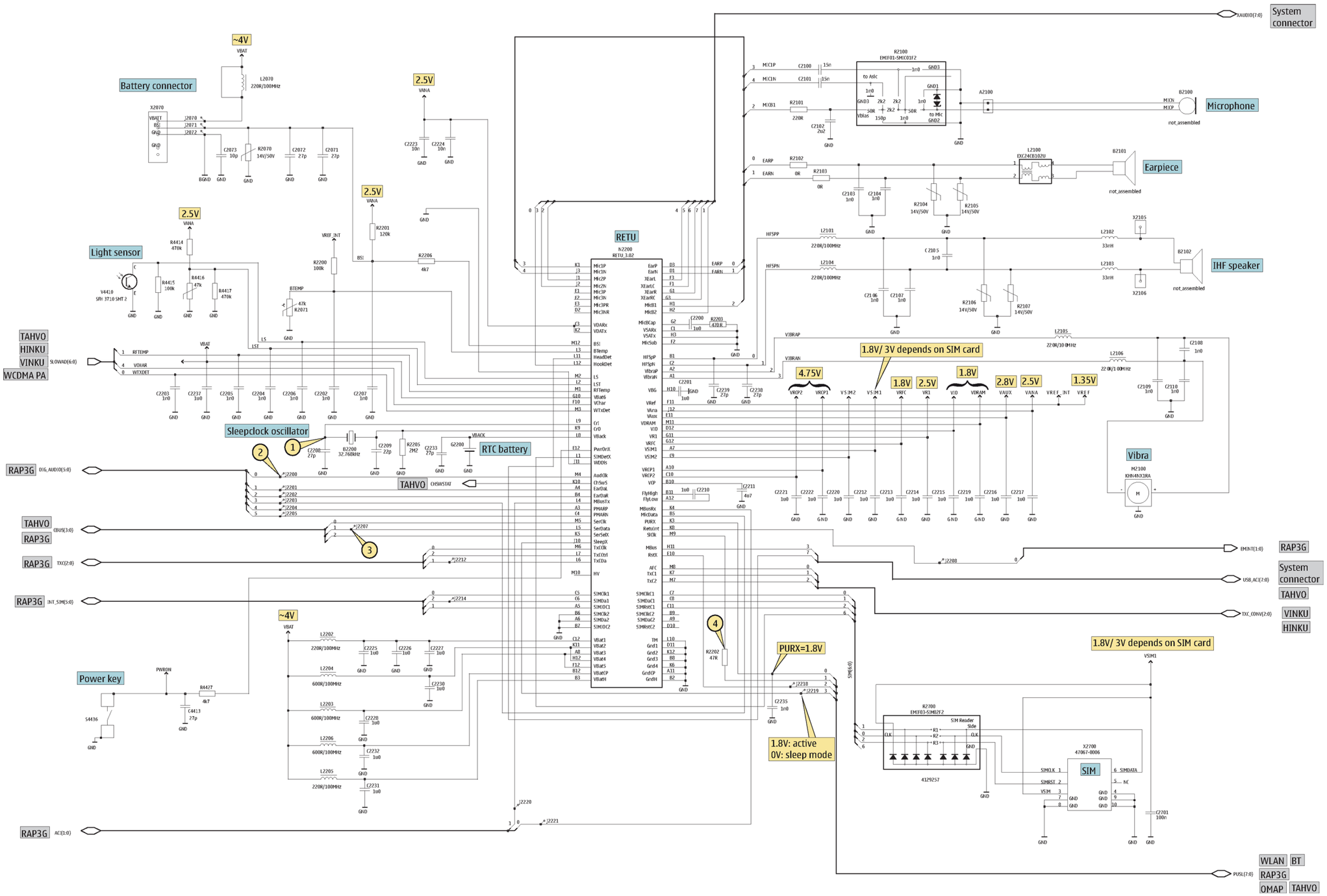
RETU, SIM and Audio



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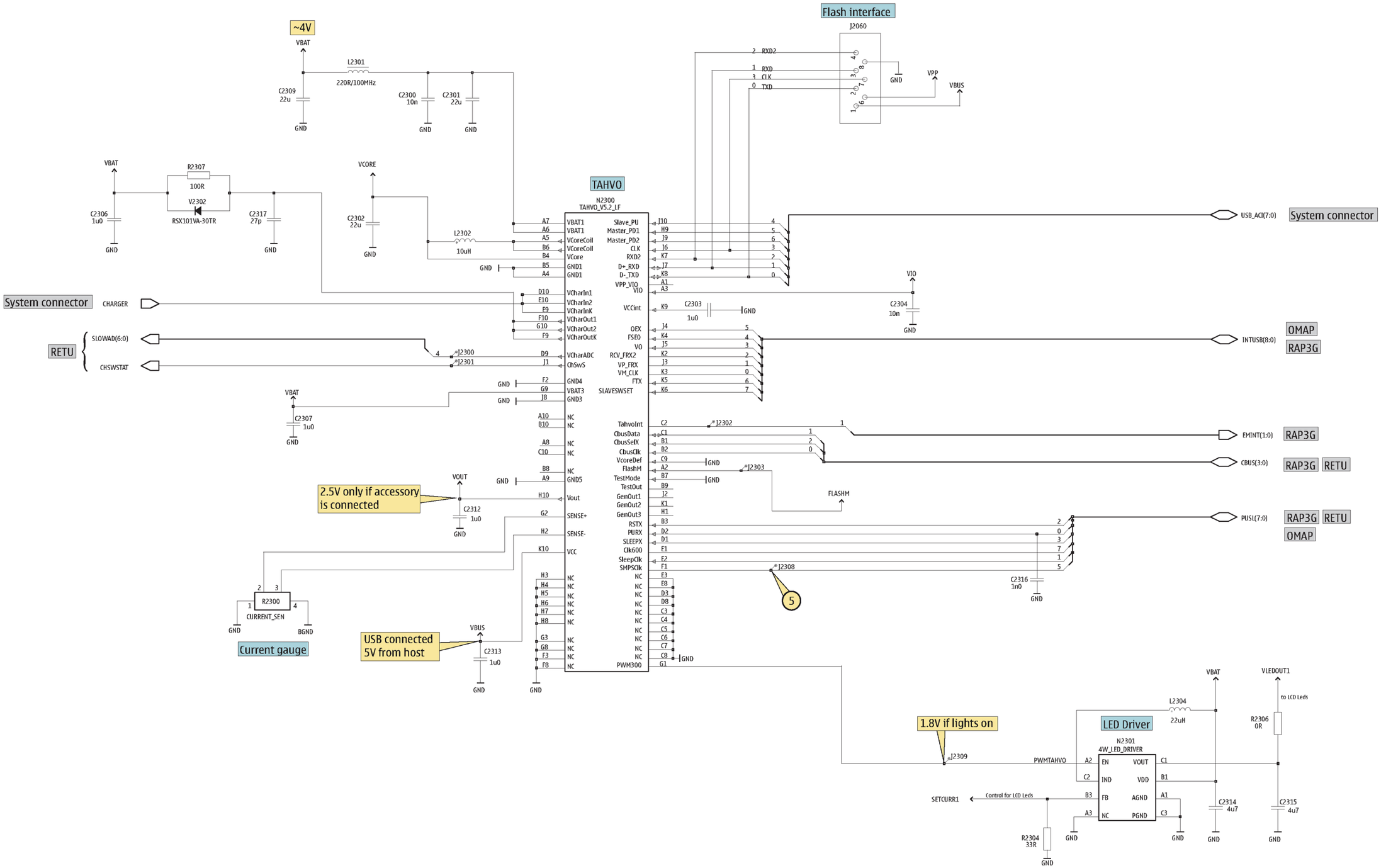
TAHVO



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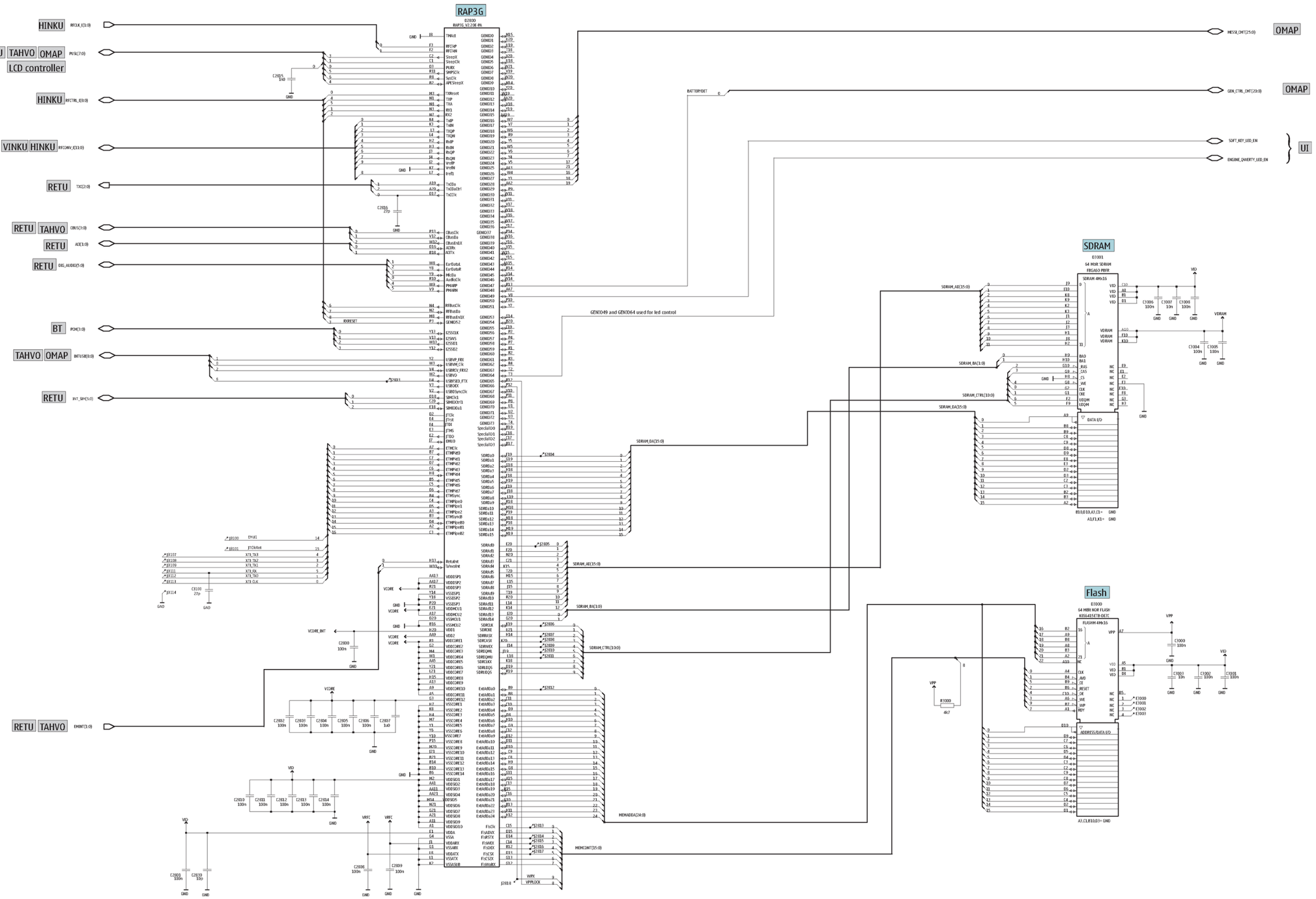
RAP3G, Flash and SDRAM



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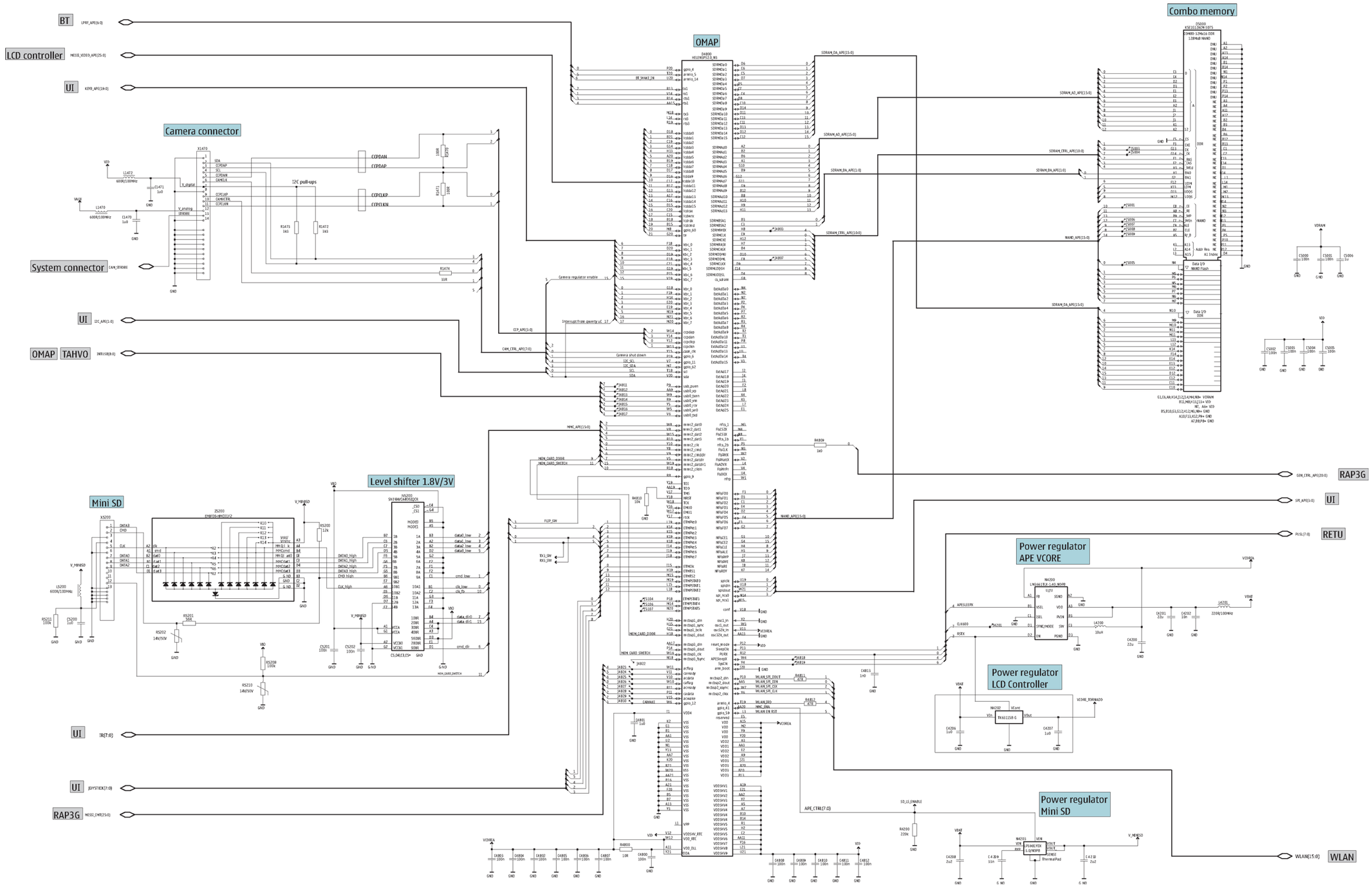
OMAP, Combo memory and MiniSD



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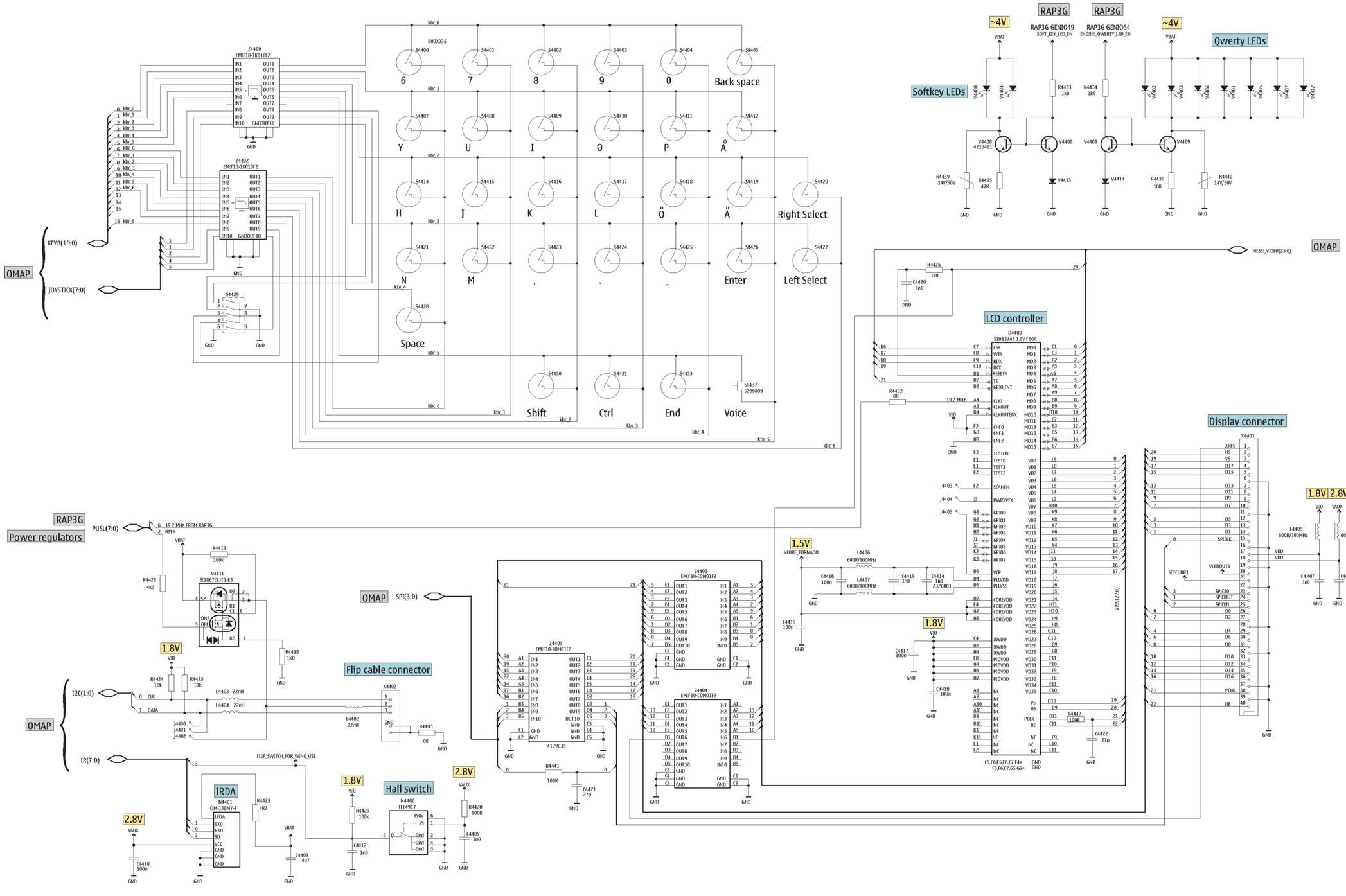
UI



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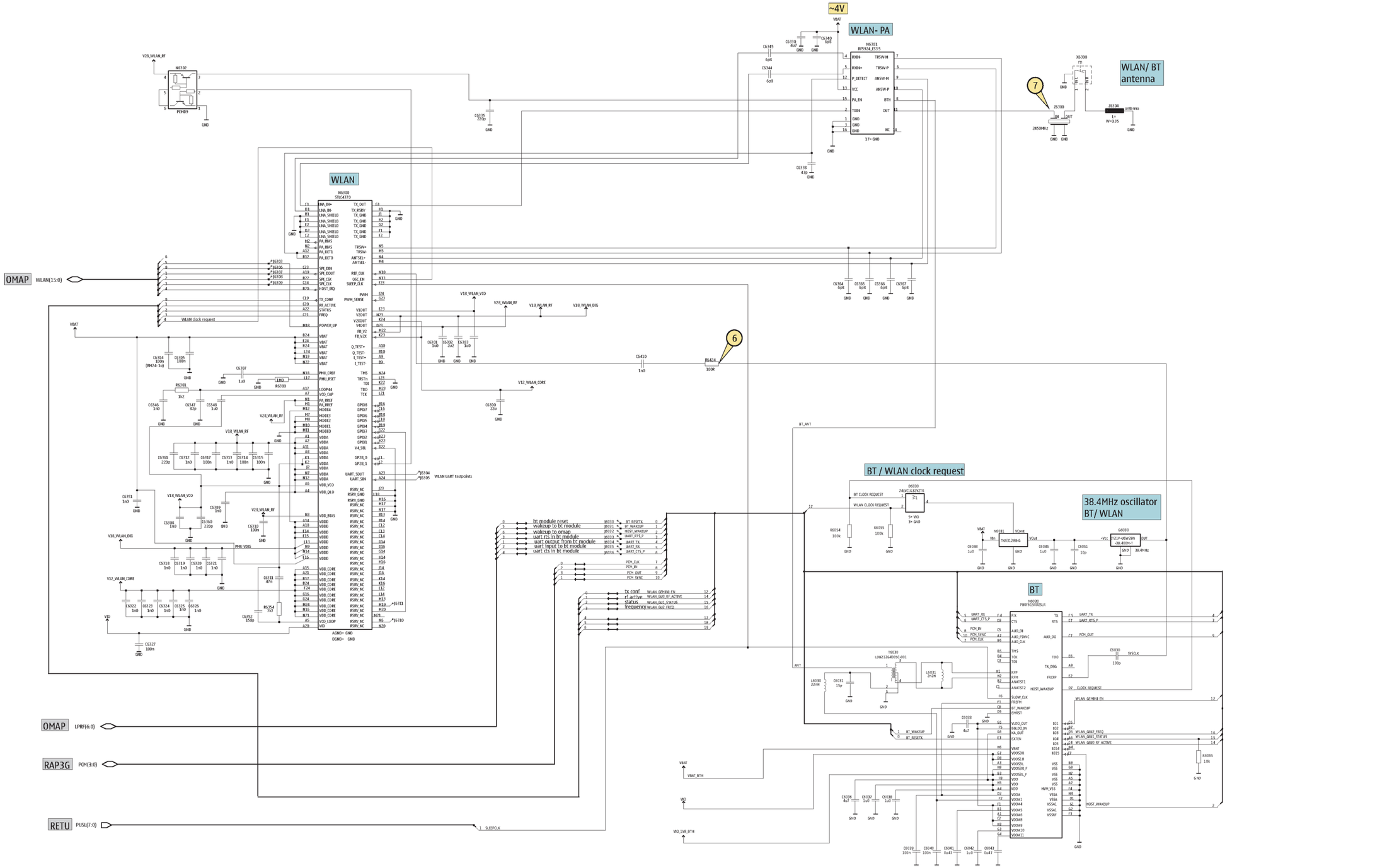
WLAN and BT



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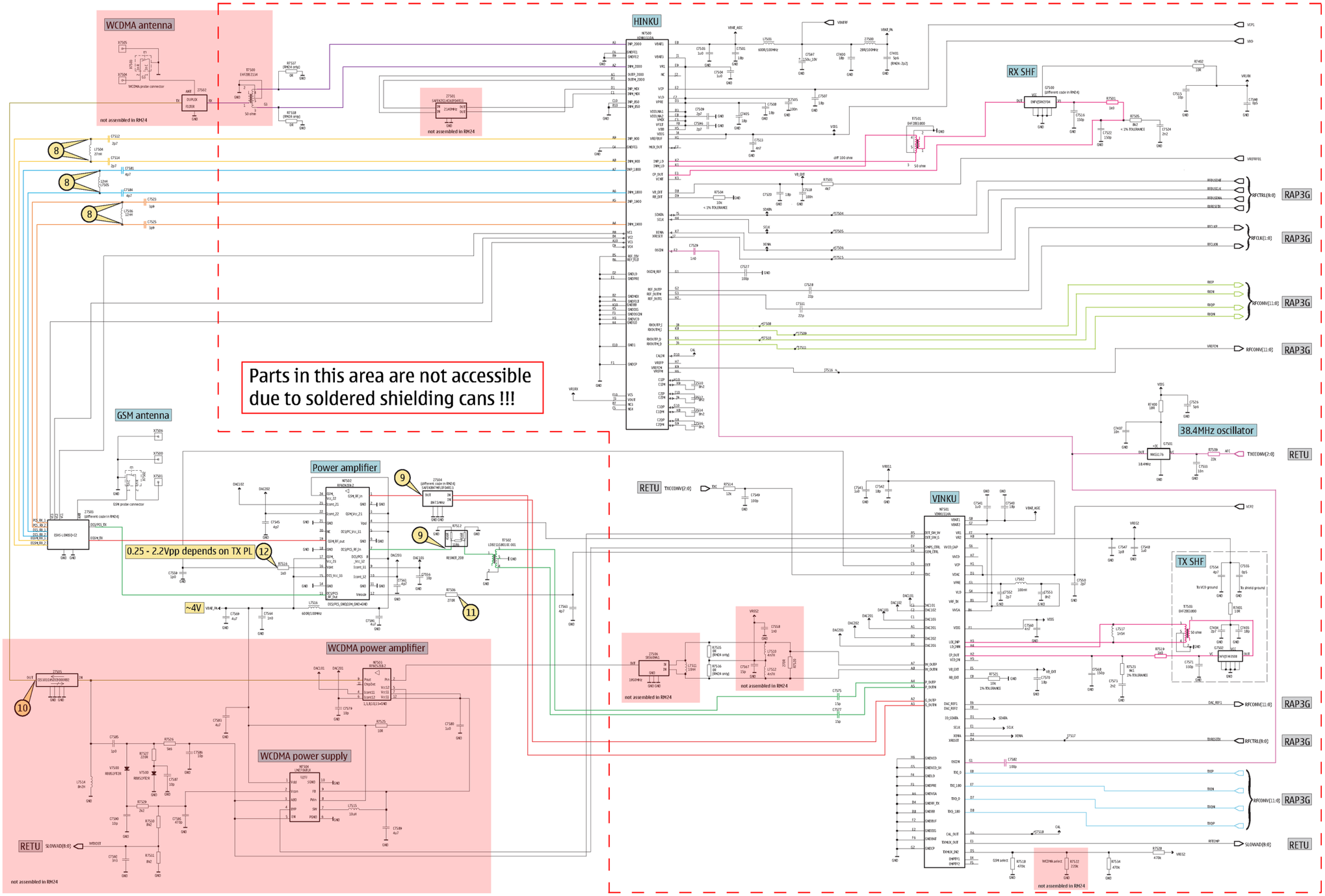
RF part



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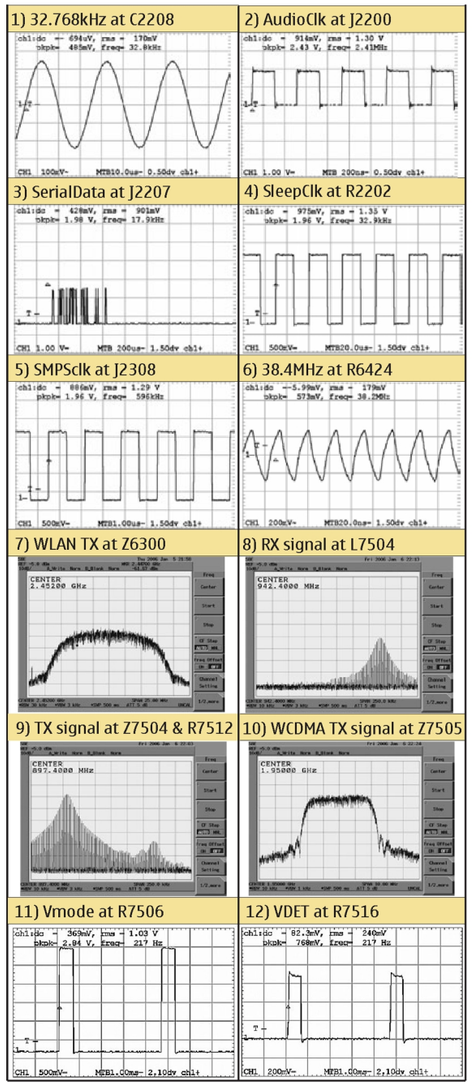
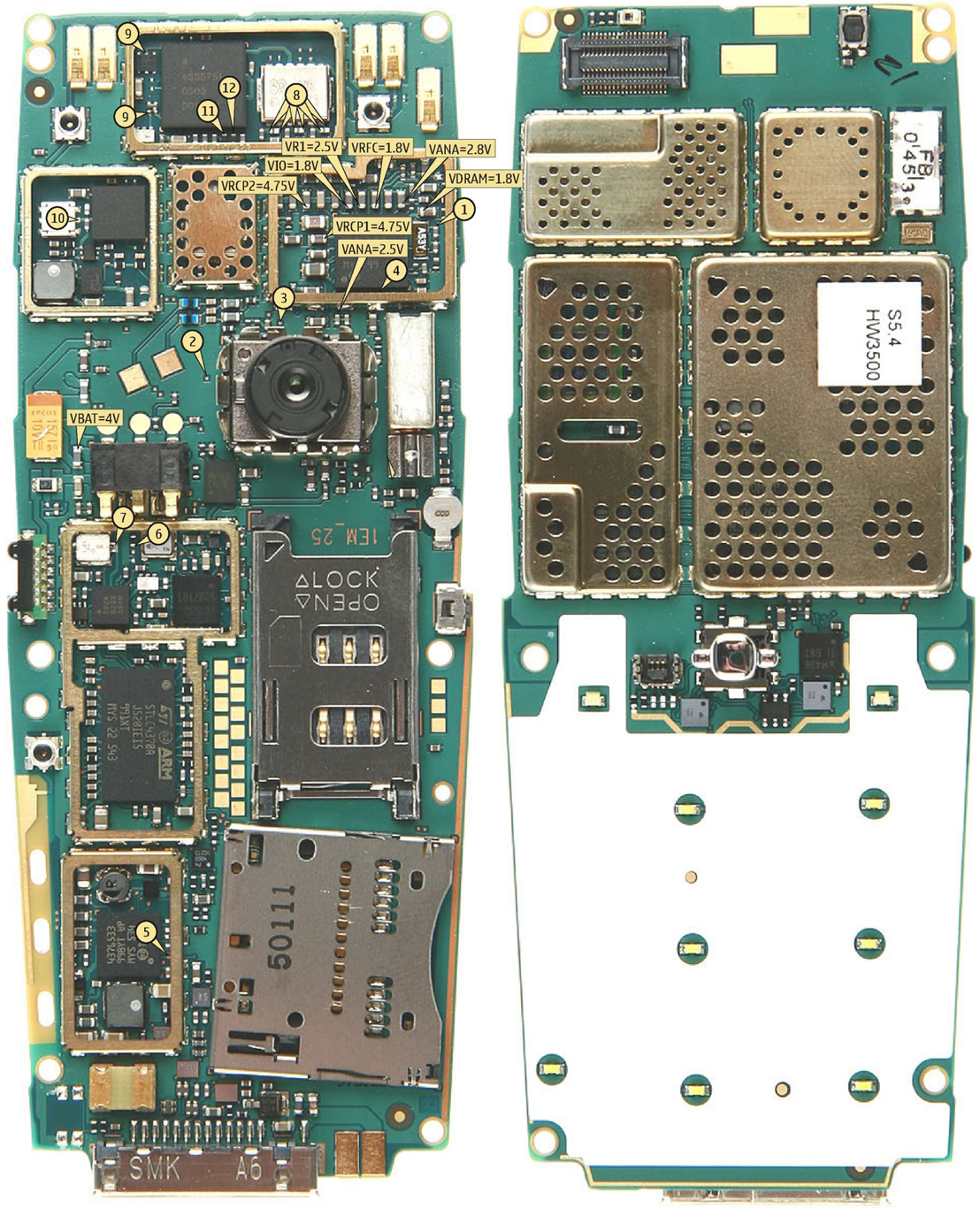
Signal overview





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Component finder

B		C2316	S6	C5002	J3	C7407	E4	C7598	D3	J6305	P5	N6302	L8	R5201	R6	V4412	P8
B2200	E2	C2317	S8	C5003	K1	C7501	E4	D		J6307	J6	N6305	P7	R5202	R6	V4413	F9
C		C2700	L3	C5004	J3	C7503	D4	D2800	G7	J6308	L6	N7500	D4	R5206	V8	V4414	F7
C1470	G4	C2800	H6	C5005	I1	C7504	D4	D3000	J8	J6310	M8	N7501	D7	R5208	P6	V7500	E8
C1471	J4	C2801	F9	C5200	R6	C7505	C3	D3001	G5	J6311	O8	N7502	B6	R5209	V8	X	
C2000	U5	C2802	F7	C5201	L7	C7507	C4	D4400	G2	J7509	H8	N7503	E7	R5210	P6	X1470	H4
C2002	V6	C2803	G9	C5202	M7	C7508	C5	D4800	J6	J7511	H8	N7504	F8	R5211	Q6	X2001	V6
C2003	U5	C2804	G6	C5203	V7	C7509	C4	D5000	J3	J7519	U6	R		R6054	L6	X2002	V3
C2004	U5	C2805	F7	C6030	K6	C7512	C3	D6030	K5	J7520	Q4	R1470	J7	R6055	L5	X2003	V3
C2005	U6	C2806	I7	C6031	L7	C7513	D3	F		L		R1471	J7	R6061	M5	X2060	E8
C2006	U6	C2807	G8	C6033	K6	C7514	C4	F2000	U4	L1470	F4	R1472	G5	R6062	L5	X2070	I7
C2011	T7	C2808	G8	C6036	L7	C7515	E3	G		L1472	I4	R1473	G5	R6064	L6	X2105	H7
C2012	V4	C2809	H9	C6037	L6	C7516	E2	G2200	J1	L2000	U4	R1474	I6	R6065	L5	X2106	G6
C2071	D2	C2810	I7	C6038	L5	C7518	E4	G6030	K7	L2001	U6	R2000	V5	R6300	O8	X2700	M3
C2100	T6	C2811	I9	C6039	K6	C7520	E4	G7500	D2	L2002	U6	R2001	U5	R6301	O6	X4401	B3
C2101	T6	C2812	F8	C6040	K6	C7522	D3	G7501	D5	L2003	U6	R2007	T7	R6303	P6	X4402	M4
C2102	S6	C2813	F7	C6041	K6	C7523	C4	G7502	E6	L2070	I8	R2009	T6	R6354	N6	X5200	S3
C2103	F3	C2814	G9	C6042	L7	C7524	C2	J		L2100	F3	R2010	R6	R6409	O6	X6300	O9
C2104	F4	C2815	I9	C6043	L7	C7525	C5	J2000	J3	L2101	F6	R2011	E1	R6410	N8	X7500	A3
C2105	F5	C2816	H7	C6044	K6	C7526	E5	J2001	R9	L2102	F6	R2012	J3	R6424	K7	X7501	A2
C2106	F5	C2830	H9	C6045	K5	C7527	C3	J2002	R9	L2103	G6	R2013	I3	R7400	E4	X7502	C3
C2107	G5	C3000	H1	C6051	K6	C7528	H9	J2003	R9	L2104	G6	R2014	J3	R7401	F6	X7503	C8
C2108	G1	C3001	J8	C6300	P8	C7529	D5	J2060	O5	L2105	H1	R2015	V5	R7402	E3	X7504	A8
C2109	G1	C3002	J8	C6301	P6	C7530	E3	J2070	H8	L2106	G1	R2070	I7	R7501	E2	X7505	A8
C2110	G1	C3003	I8	C6302	P8	C7531	H9	J2071	H7	L2202	D2	R2071	T6	R7503	E4	X7506	B1
C2200	G3	C3004	F5	C6303	P7	C7532	E3	J2072	H6	L2203	D2	R2100	S6	R7504	E4	Z	
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C2203	F2	C3007	G6	C6307	O8	C7536	E4	J2204	G7	L2206	J5	R2103	F3	R7509	E5	Z2003	T6
C2204	F2	C3008	G4	C6308	N6	C7540	E6	J2205	F6	L2301	T8	R2104	F3	R7512	B7	Z2004	U6
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C2206	F2	C4200	H5	C6310	M8	C7542	E7	J2208	H7	L2304	Q8	R2106	F5	R7516	C5	Z4402	N4
C2207	D2	C4201	H5	C6311	M6	C7543	E7	J2212	H6	L4200	H5	R2107	G6	R7518	C8	Z4403	F2
C2208	E1	C4202	I3	C6312	M8	C7545	A6	J2214	F5	L4201	I3	R2200	F2	R7519	D5	Z4404	F3
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C2215	D3	C4210	J6	C6320	O6	C7554	F6	J2302	L8	L4407	G3	R2306	Q7	R7527	E8	Z7503	B4
C2216	F4	C4405	F3	C6321	N8	C7555	F6	J2303	S7	L5200	Q6	R2307	S8	R7528	C8	Z7504	B7
C2217	D2	C4406	L6	C6322	P7	C7556	C6	J2308	R6	L6030	L7	R2700	L4	R7529	E8	Z7505	E9
C2219	E1	C4407	F3	C6323	O8	C7558	D8	J2309	Q7	L6031	L7	R3000	I1	R7530	E7	Z7506	E7
C2220	E4	C4409	J8	C6324	O8	C7559	C5	J3103	M9	L7502	C6	R4200	I6	R7531	E7		
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C2224	G3	C4414	H3	C6330	K8	C7564	B5	J3108	N5	L7506	C4	R4417	A3	S4436	A7		
C2225	D4	C4415	G3	C6335	L8	C7567	D7	J3109	N5	L7510	D8	R4418	F6	S4437	L1		
C2226	D3	C4416	G3	C6338	K8	C7568	C6	J3111	M5	L7511	D7	R4419	F7	S5200	V8		
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C2239	F3	C4803	I7	C6361	M6	C7582	C6	J4813	R7	N2300	R7	R4433	F8	V2302	S8		
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C2302	S7	C4806	J7	C6364	L7	C7585	E8	J5104	O5	N4201	I2	R4436	F8	V4402	U2		
C2303	R8	C4807	L7	C6365	L7	C7586	E9	J5106	N5	N4202	G3	R4439	F9	V4403	R8		
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C2306	T8	C4809	I6	C6367	K7	C7589	F8	J6030	K6	N4400	N6	R4441	H6	V4405	P4		
C2307	R8	C4810	I6	C6410	N8	C7590	E8	J6031	L7	N4401	K9	R4442	H2	V4406	U7		
C2309	T8	C4811	G5	C7400	G8	C7591	E7	J6032	L6	N5200	M7	R4445	N3	V4407	R4		
C2312	R8	C4812	I4	C7401	C9	C7592	E7	J6033	M6	N6030	L6	R4800	J4	V4408	F8		
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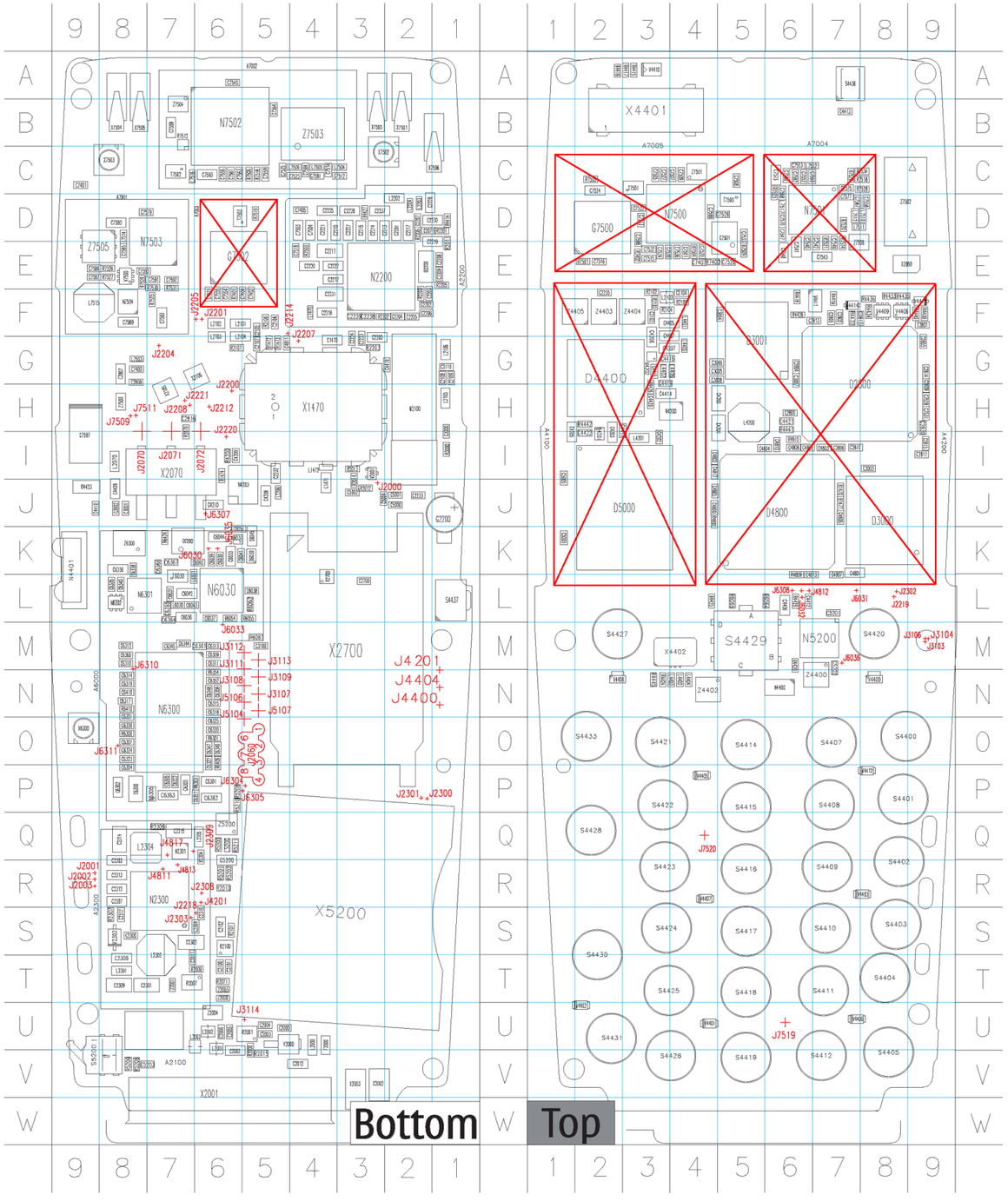

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Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

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DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

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LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

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SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP, Official Tiku3G
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)

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